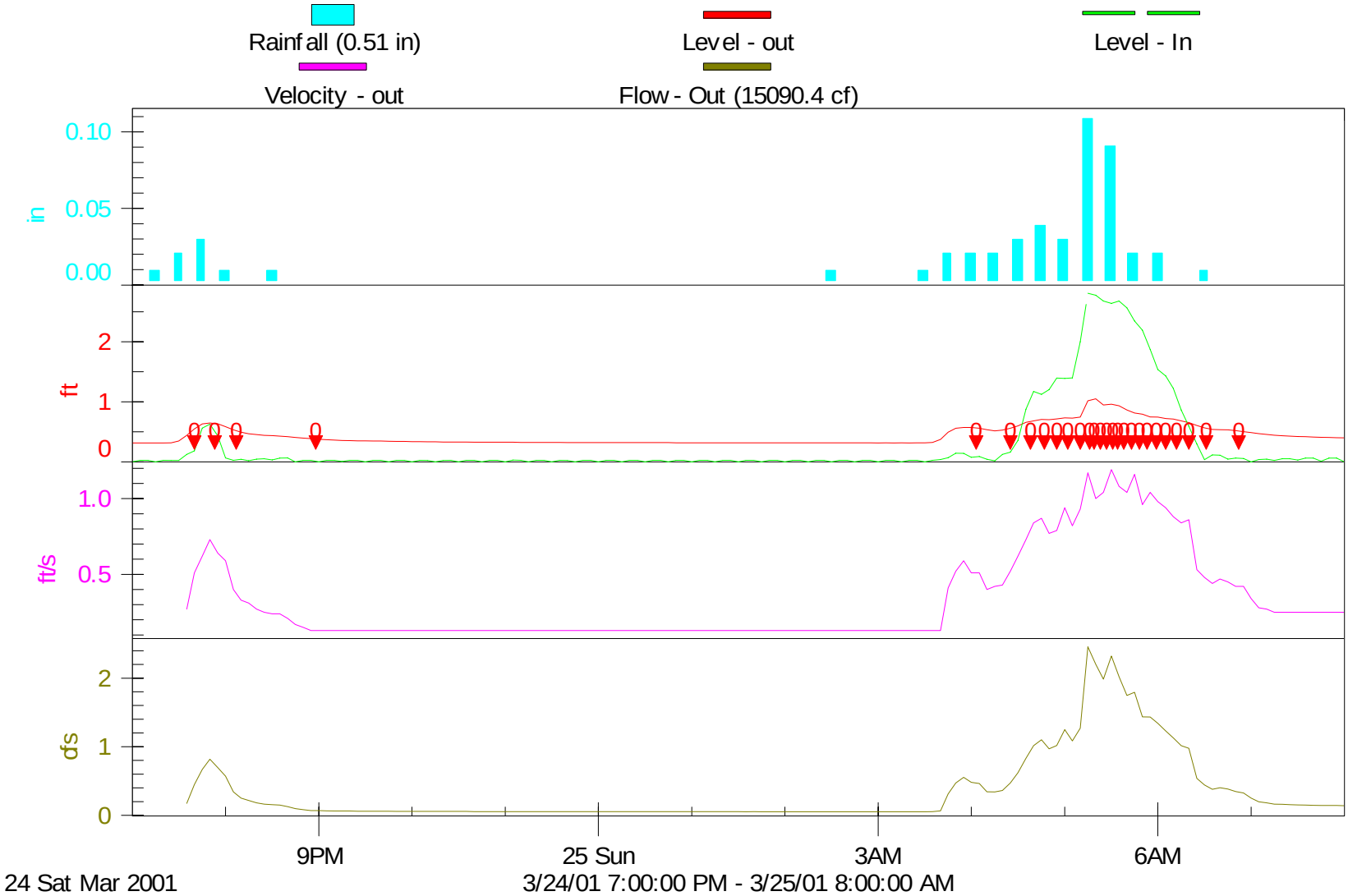
APPENDIX A – Storm Event Monitoring Results

The contents of Appendix A are organized by storm event number 1 through 11. The materials included for each storm event are:

1. Storm Event Graph that shows rainfall, inlet and outlet water level, outlet water velocity and flow rate, and sample event marks (noted with the symbol ⇩). Total storm event flow volume and rainfall depth are noted the graph legend;
2. Full laboratory results from North Creek Analytical;
3. Particle size analysis methods and results from UW; and
4. Field sheets.

SR 405 Vortechs

Storm #1, 24-25 March 2001



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Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

PROJECT NARRATIVE for B1C0577

Client: Taylor Associates
Project Manager: Ingrid Wertz
Project Name: SR405 Vortechs
Project Number: Not Provided

1.0 DESCRIPTION OF CASE

Two water sample were received for the analysis of:

- Total Zinc by EPA 200.8
- Dissolved Zinc by EPA 200.8
- Hardness by SM2340B
- Orthophosphate by EPA 365.2
- Total Phosphorous by EPA 365.2
- Total Suspended Solids by EPA 160.2
- Turbidity
- PH by EPA 150.1

2.0 COMMENTS ON SAMPLE RECEIPT

The samples were received in 5L Poly bottles then split into the appropriate sample container upon receipt then logged in on 26th March 2001 at a temperature of 4.6C.

Preparation and Analysis

The dissolved metals were filtered and preserved in house with Nitric Acid. There were no anomalies associated with the requested analyses, all QA criteria were within method established control limits.

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Amar Gill
Project Manager
North Creek Analytical

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VOR-032501-IN	B1C0577-01	Water	03/25/01 06:52	03/26/01 11:16
VOR-032501-OUT	B1C0577-02	Water	03/25/01 06:52	03/26/01 11:16

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Total Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-032501-IN (B1C0577-01) Water	**Sampled: 03/25/01 06:52**		**Received: 03/26/01 11:16**						
Zinc	**0.129**	0.0100	mg/l	1	1C27040	03/27/01	03/29/01	EPA 200.8	
VOR-032501-OUT (B1C0577-02) Water	**Sampled: 03/25/01 06:52**		**Received: 03/26/01 11:16**						
Zinc	**0.117**	0.0100	mg/l	1	1C27040	03/27/01	03/29/01	EPA 200.8	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Dissolved Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-032501-IN (B1C0577-01) Water	**Sampled: 03/25/01 06:52**		**Received: 03/26/01 11:16**						**Q-30**
Zinc	**0.0316**	0.0100	mg/l	1	1C23028	03/23/01	03/29/01	EPA 200.8	
VOR-032501-OUT (B1C0577-02) Water	**Sampled: 03/25/01 06:52**		**Received: 03/26/01 11:16**						**Q-30**
Zinc	**0.0271**	0.0100	mg/l	1	1C23028	03/23/01	03/29/01	EPA 200.8	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-032501-IN (B1C0577-01) Water	**Sampled: 03/25/01 06:52 Received: 03/26/01 11:16**								
Hardness	**38.3**	1.00	mg eq. CaCO3/L	1	1C26045	03/26/01	03/29/01	SM 2340B	
Orthophosphate-phosphorus	ND	0.00200	mg/l	"	1C27008	03/26/01	03/26/01	EPA 365.2	
Phosphorus	**0.510**	0.0250	"	5	1C30030	03/30/01	03/30/01	"	
pH	**6.78**		pH Units	1	1C27059	03/26/01	03/26/01	EPA 150.1	
Total Suspended Solids	**200**	4.0	mg/l	"	1D02039	03/28/01	03/29/01	EPA 160.2	
Turbidity	**152**	1.00	NTU	"	1C27060	03/26/01	03/26/01	EPA 180.1	
VOR-032501-OUT (B1C0577-02) Water	**Sampled: 03/25/01 06:52 Received: 03/26/01 11:16**								
Hardness	**40.4**	1.00	mg eq. CaCO3/L	1	1C26045	03/26/01	03/29/01	SM 2340B	
Orthophosphate-phosphorus	**0.00259**	0.00200	mg/l	"	1C27008	03/26/01	03/26/01	EPA 365.2	
Phosphorus	**0.443**	0.0250	"	5	1C30030	03/30/01	03/30/01	"	
pH	**6.96**		pH Units	1	1C27059	03/26/01	03/26/01	EPA 150.1	
Total Suspended Solids	**180**	4.0	mg/l	"	1D02039	03/28/01	03/29/01	EPA 160.2	
Turbidity	**129**	1.00	NTU	"	1C27060	03/26/01	03/26/01	EPA 180.1	

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Total Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1C27040: Prepared 03/27/01 Using EPA 200 Series										
Blank (1C27040-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1C27040-BS1)										
Zinc	0.184	0.0100	mg/l	0.200		92.0	85-115			
Matrix Spike (1C27040-MS1)					**Source: B1C0549-02**					
Zinc	0.165	0.0100	mg/l	0.200	ND	78.9	75-125			
Matrix Spike Dup (1C27040-MSD1)					**Source: B1C0549-02**					
Zinc	0.181	0.0100	mg/l	0.200	ND	86.9	75-125	9.25	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Dissolved Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1C23028: Prepared 03/23/01 Using EPA 3005A										
Blank (1C23028-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1C23028-BS1)										
Zinc	0.192	0.0100	mg/l	0.200		96.0	85-115			
Matrix Spike (1C23028-MS1)					**Source: B1C0411-20**					
Zinc	0.268	0.0100	mg/l	0.200	0.0901	89.0	75-125			
Matrix Spike Dup (1C23028-MSD1)					**Source: B1C0411-20**					
Zinc	0.272	0.0100	mg/l	0.200	0.0901	91.0	75-125	1.48	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1C26045: Prepared 03/26/01 Using EPA 3010A										
Blank (1C26045-BLK1)										
Hardness	ND	1.00	mg eq. CaCO3/L							
LCS (1C26045-BS1)										
Hardness	74.0	1.00	mg eq. CaCO3/L				70-130			
Matrix Spike (1C26045-MS1)					**Source: B1C0468-34**					
Hardness	340	1.00	mg eq. CaCO3/L		282		75-125			
Matrix Spike Dup (1C26045-MSD1)					**Source: B1C0468-34**					
Hardness	341	1.00	mg eq. CaCO3/L		282		75-125	0.294	20	
Batch 1C27008: Prepared 03/26/01 Using General Preparation										
Blank (1C27008-BLK1)										
Orthophosphate-phosphorus	ND	0.00200	mg/l							
LCS (1C27008-BS1)										
Orthophosphate-phosphorus	0.0513	0.00200	mg/l	0.0500		103	90-110			
Duplicate (1C27008-DUP1)					**Source: B1C0577-01**					
Orthophosphate-phosphorus	ND	0.00200	mg/l		ND			20.1	25	
Matrix Spike (1C27008-MS1)					**Source: B1C0577-01**					
Orthophosphate-phosphorus	0.0527	0.00200	mg/l	0.0500	ND	102	80-120			
Batch 1C27059: Prepared 03/26/01 Using General Preparation										
Duplicate (1C27059-DUP1)					**Source: B1C0577-01**					
pH	6.87		pH Units		6.78			1.32	10	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1C27060: Prepared 03/26/01 Using General Preparation										
Blank (1C27060-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (1C27060-BS1)										
Turbidity	21.6	1.00	NTU	20.0		108	90-110			
Duplicate (1C27060-DUP1)					**Source: B1C0577-01**					
Turbidity	164	1.00	NTU		152			7.59	20	
Batch 1C30030: Prepared 03/30/01 Using General Preparation										
Blank (1C30030-BLK1)										
Phosphorus	ND	0.00500	mg/l							
LCS (1C30030-BS1)										
Phosphorus	0.0507	0.00500	mg/l	0.0500		101	90-120			
Matrix Spike (1C30030-MS1)					**Source: B1C0579-01**					
Phosphorus	2.50	0.0500	mg/l	0.500	2.08	84.0	60-139			
Matrix Spike Dup (1C30030-MSD1)					**Source: B1C0579-01**					
Phosphorus	2.51	0.0500	mg/l	0.500	2.08	86.0	60-139	0.399	25	
Batch 1D02039: Prepared 03/28/01 Using General Preparation										
Blank (1D02039-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D02039: Prepared 03/28/01 Using General Preparation										
Duplicate (1D02039-DUP1)					**Source: B1C0629-05**					
Total Suspended Solids	15	4.0	mg/l		15			0.0	19	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	04/09/01 11:52

Notes and Definitions

Q-30	This sample was laboratory filtered since it was not field filtered as is required by the methodology.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

B1C0577

CHAIN OF CUSTODY RECORD

Sample Collection by: TAYLOR ASSOCIATES
Contact: Ingrid Wertz
Tel: 206.633.4486

Client: ~~Client:~~ WSDOT
Contact: Naomi Chechowitz
Tel: 206.440.4602

Laboratory: North Creek Analytical
Contact: Amar Gill
Tel: 425.420.9232

or

~~University of Washington~~
~~Contact: David Stensel~~
~~Tel: 206.543.9358~~

Page: 1 of 1
Project ID: SR405 - Vortechs
Case File #:
Date recorded by:

standard turnaround

SR405 Vortechs™ Monitoring Project

Sample ID	Date Collected	Time Collected	Comp?	Grab?	# of contain.	matrix	Analysis Required: TSS	Turbidity	Hardness	Total Zn	Dissolved Zn	TP	Ortho-P	~~PSD~~	Other? pH	~~Other?~~	Notes
VDR-032501-IN	3/25/01	6:52am			1	W	✓	✓	✓	✓	✓	✓	✓		✓		01
VDR-032501-OUT	3/25/01	6:52am			1	W	✓	✓	✓	✓	✓	✓	✓		✓		02

Comments/Special Notes:

* ~~Test~~ Tim test subsample of amount collected.

Relinquished by:	Ingrid Wertz	Relinquished by:
Signature		Signature
Printed Name	Ingrid Wertz	Printed Name
Company	Taylor Associates	Company
Date/Time	3/26/01 10:15	Date/Time
Received by:	~~Holly~~ Weaver	Received by:
Signature		Signature
Printed Name	~~Holly~~ Weaver	Printed Name
Company	NCA	Company
Date/Time	3/26/01 11:16AM	Date/Time

4.6 w/o

PSD, TSS, VSS Procedures
Prepared 8/21/01 by the University of Washington Department of Civil Engineering

1. Calibrate weighing tins + blank filter papers (size: 4.7cm) by placing them in 105° C oven for ~2 hrs.
2. Measure sample volume.
3. Pour sample through 850-, 425-, 212-micrometer sieves (in that order from top to bottom!)
4. Place sieves upside down into corresponding marked beakers & rinse through with distilled water.
5. Take remaining sample to particle size analyzer (PSA).
6. Rinse PSA chamber with milli-q water.
7. Aquire background sample with milli-q water (see manual for instructions). It is important to minimize the amount of bubbles in the chamber.
8. After calibration aquire 3 readings for each sample (3 separate subsamples). It is best to re-calibrate between samples. Be sure to note the number assigned by the PSA to each reading. Also keep drained subsamples for later analysis.
9. Rinse chamber.
10. Take sample including the portions run through the sieves to vacuum pump.
11. Take weighing tins with filter papers out of the oven and record the dry weights. First, remember to always calibrate the scale.
12. Place filter paper onto the vacuum pump and secure.
13. Pour each size fraction through and record which tin # goes with which size fraction. Remember to rinse off any particles that may stick to vacuum device onto the filter paper.
14. Set the tins back in the 105° C oven for ~2 hrs.
15. Calibrate scale, weigh and record post dry weights. These numbers will be used to calculate TSS values.
16. For VSS values, place tins in 550° C oven for 15-20 mins. Then repeat step 15.

Report

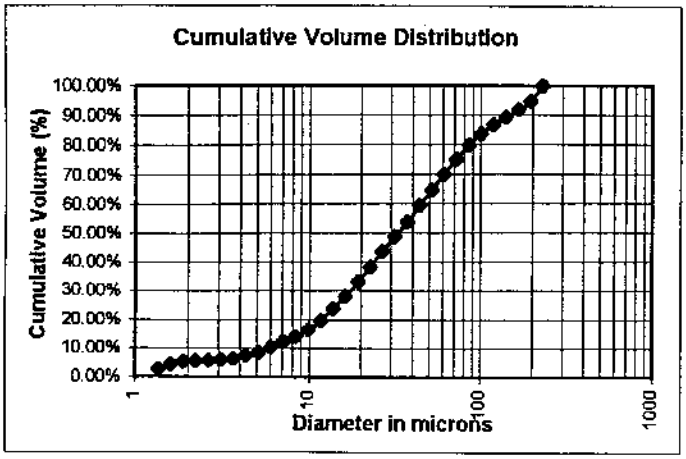
1. Total mass is calculated for the volume of sample that is given to us.
2. The D-values are calculated based on particles that are < 212.
3. Mass is calculated by multiplying %vol by TSS for each size fraction, then summing for a total.

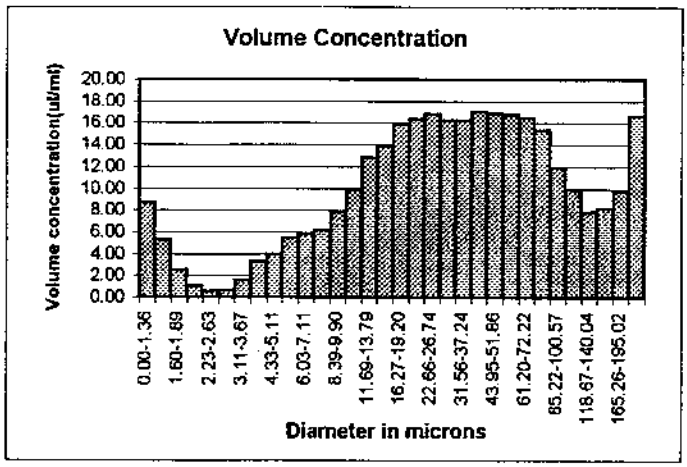
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Joyce Chang
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	SR405 - Vortechs
Sample ID:	VOR-032501-IN
Date and Time Collected:	3/25/01 6:52am
Date and Time of PSD Analysis:	3/26/01 5:46pm





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass Concentration (mg / l)
0.00-1.36	8.75	2.75%	5.59
1.36-1.60	5.28	4.41%	3.37
1.60-1.89	2.58	5.22%	1.65
1.89-2.23	1.10	5.56%	0.70
2.23-2.63	0.57	5.74%	0.36
2.63-3.11	0.64	5.94%	0.41
3.11-3.67	1.61	6.45%	1.03
3.67-4.33	3.31	7.49%	2.11
4.33-5.11	3.96	8.73%	2.53
5.11-6.03	5.46	10.45%	3.48
6.03-7.11	5.84	12.28%	3.73
7.11-8.39	6.20	14.23%	3.96
8.39-9.90	7.81	16.68%	4.99
9.90-11.69	9.91	19.80%	6.33
11.69-13.79	12.85	23.83%	8.20
13.79-16.27	13.87	28.19%	8.85
16.27-19.20	15.89	33.18%	10.14
19.20-22.66	16.38	38.33%	10.46
22.66-26.74	16.84	43.62%	10.75
26.74-31.56	16.29	48.74%	10.40
31.56-37.24	16.26	53.85%	10.38
37.24-43.95	17.10	59.22%	10.91
43.95-51.86	16.90	64.53%	10.79
51.86-61.20	16.81	69.81%	10.73
61.20-72.22	16.49	74.99%	10.53
72.22-85.22	15.38	79.82%	9.82
85.22-100.57	11.90	83.56%	7.60
100.57-118.67	9.91	86.67%	6.33
118.67-140.04	7.82	89.13%	4.99
140.04-165.26	8.21	91.71%	5.24
165.26-195.02	9.72	94.76%	6.21
195.02-230.14	16.68	100.00%	10.65
Total	318.29		203.20

Computed Statistics:

Weight Mean =	58.92	microns
D_{10} =	5.11	microns
D_{50} =	31.56	microns
D_{90} =	140.04	microns

Size Range (microns)	Mass of TSS (mg)	% Mass
< 212	203.20	95.62%
212-425	4.40	2.07%
425-850	2.20	1.04%
>850	2.70	1.27%
Total	212.50	100.00%

Volume of Sample: 800 ml
Volume of Dilution: 1200 ml added

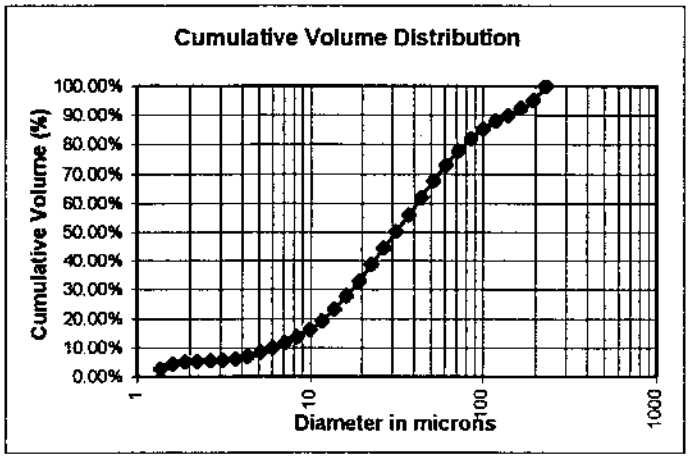
Comments: The sample was diluted with deionized water. VSS was not measured for the sample.

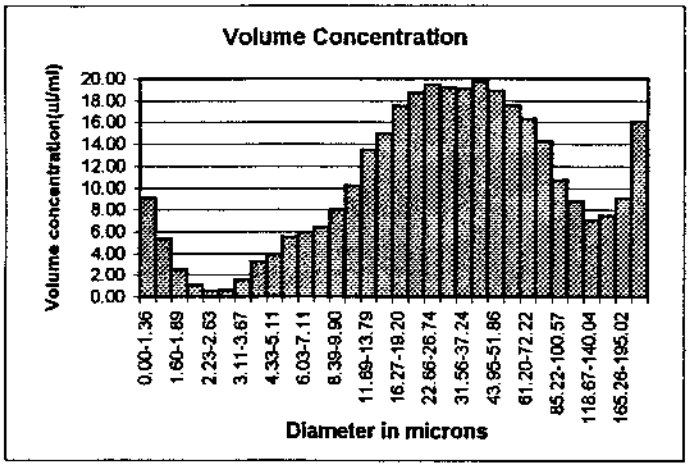
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Joyce Chang
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID: SR405 - Vortechs
Sample ID: VOR-032501-OUT
Date and Time Collected: 3/25/01 6:52am
Date and Time of PSD Analysis: 3/26/01 8:00pm





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass Concentration (mg / l)
0.00-1.36	9.05	2.73%	4.89
1.36-1.60	5.33	4.33%	2.88
1.60-1.89	2.53	5.09%	1.37
1.89-2.23	1.04	5.41%	0.56
2.23-2.63	0.53	5.56%	0.28
2.63-3.11	0.60	5.75%	0.33
3.11-3.67	1.55	6.21%	0.84
3.67-4.33	3.24	7.19%	1.75
4.33-5.11	3.91	8.36%	2.11
5.11-6.03	5.50	10.02%	2.97
6.03-7.11	5.94	11.81%	3.21
7.11-8.39	6.39	13.73%	3.45
8.39-9.90	8.02	16.15%	4.33
9.90-11.69	10.23	19.23%	5.53
11.69-13.79	13.45	23.28%	7.27
13.79-16.27	14.96	27.78%	8.09
16.27-19.20	17.50	33.05%	9.46
19.20-22.66	18.70	38.68%	10.11
22.66-26.74	19.45	44.54%	10.51
26.74-31.56	19.14	50.30%	10.34
31.56-37.24	19.08	56.04%	10.31
37.24-43.95	19.73	61.98%	10.66
43.95-51.86	18.85	67.66%	10.19
51.86-61.20	17.58	72.95%	9.50
61.20-72.22	16.32	77.86%	8.82
72.22-85.22	14.23	82.15%	7.69
85.22-100.57	10.75	85.38%	5.81
100.57-118.67	8.76	88.02%	4.73
118.67-140.04	7.08	90.15%	3.83
140.04-165.26	7.50	92.41%	4.05
165.26-195.02	9.11	95.15%	4.92
195.02-230.14	16.10	100.00%	8.70
Total	332.17		179.50

Computed Statistics:
Weight Mean = 55.90 microns
D_{10} = 5.11 microns
D_{50} = 26.74 microns
D_{90} = 118.67 microns

Size Range (microns)	Mass of TSS (mg)	% Mass
< 212	179.50	99.01%
212-425	0.90	0.50%
425-850	0.60	0.33%
>850	0.30	0.17%
Total	181.30	100.00%

Volume of Sample: 800 ml
Volume of Dilution: 1200 ml added
Comments: The sample was diluted with deionized water. VSS was not measured for the sample.

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 3/29/01 1000 Field Staff LW Weather clear ~50°

Pre-Strom Visit - or - Post-Storm Visit (circle one)

INLET

Check Current Readings / Download:

ISCO	Time? reset (Y/N)?	✓
	Time downloaded	✓

OUTLET

Check Current Readings / Download:

ISCO	Time? reset (Y/N)?	✓
	Level (ft.)	.314'
	Velocity (f/s)	.03 fps
	Flow (cfs)	0.0
	Total Flow (cf)	111385
	Sig/Spec str.	0/0
	Time downloaded	

Pre - Storm Visit

INLET

Battery (V)	12.6
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y
Sampler tubing ok (Y/N)?	Y
Strainer ok?	Y
Ext. desiccant ok (Y/N)? Changed?	Y
Int. desiccant ok (Y/N)? Changed?	Y
Measure Dn level? Ok?	✓
Sample Volume (ml)	200
Inspect Rain Gage	✓

OUTLET

Battery (V)	12.6
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y/N
Sampler tubing ok (Y/N)?	Y/N
Strainer ok?	Y
Ext. desiccant ok (Y/N)? Changed?	Y - red red house
Int. desiccant ok (Y/N)? Changed?	Ok - N
Measure Dn level? Ok?	ok
Enable level (ft)	.43'
Pacing (cf) / Sample Volume (ml)	500 cf / 200 ml

Post - Storm Visit

INLET

Equipment Ran Completely?	
Sampler Enabled (date/time)?	
Composite Began (date/time)?	
Number of subsamples taken?	
Any subsample collection errors?	
Last Sample (date/time)?	
Est. Sample Volume Collected (ml)	
Sample ID?	

OUTLET

Equipment Ran Completely?	
Sampler Enabled (date/time)?	
Composite Began (date/time)?	
Number of subsamples taken?	
Any subsample collection errors?	
Last Sample (date/time)?	
Est. Sample Volume Collected (ml)	
Sample ID?	

Y/N	Value	Storm Validation Criteria
	hrs. (if known)	Was there an antecedent dry period of at least six hours?
	in.	Was total rainfall greater than or equal to 0.25"?
	hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
	# subsample	Were at least 10 sub-samples collected at the inlet?
	# subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. _____ Field blank collected? If so, Sample ID. _____

NOTES (including any problems with equipment or maintenance activities performed):

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 3/25/01 8:30 Field Staff IW Weather overcast ~45

Pre-Strom Visit - or - Post-Storm Visit (circled) (circle one)

INLET

Check Current Readings / Download: ✓

ISCO Time? reset (Y/N)? Y
Time downloaded 8:50

OUTLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? —
Level (ft.) 0.381
Velocity (f/s) * 0.16 *
Flow (cfs) * 0.02 *
Total Flow (cf) 13338
Sig/Spec str. ok
Time downloaded 8:42 / [illegible] 3/24 19:30

Pre - Storm Visit

INLET

Battery (V) 12.15 [illegible]
Clean bottle (Y/N)?
Pump tubing ok (Y/N)? Replaced?
Sampler tubing ok (Y/N)?
Strainer ok?
Ext. desiccant ok (Y/N)? Changed?
Int. desiccant ok (Y/N)? Changed?
Measure Dn level? Ok?
Sample Volume (ml)
Inspect Rain Gage

OUTLET

Battery (V) 12.31 [illegible]
Clean bottle (Y/N)?
Pump tubing ok (Y/N)? Replaced?
Sampler tubing ok (Y/N)?
Strainer ok?
Ext. desiccant ok (Y/N)? Changed?
Int. desiccant ok (Y/N)? Changed?
Measure Dn level? Ok?
Enable level (ft)
Pacing (cf) / Sample Volume (ml)

Post - Storm Visit

INLET

Equipment Ran Completely? N
Sampler Enabled (date/time)? 3/14 10:07
Composite Began (date/time)? 3/24 19:35
Number of subsamples taken? 27 [illegible]
Any subsample collection errors? Y * see back
Last Sample (date/time)? 3/25 6:51
Est. Sample Volume Collected (ml) ~4L ✓
Sample ID? VR-032501-IN

OUTLET

Equipment Ran Completely? Y
Sampler Enabled (date/time)? 3/24 19:40
Composite Began (date/time)? 3/24 19:40
Number of subsamples taken? 27
Any subsample collection errors? N
Last Sample (date/time)? 3/25 6:52
Est. Sample Volume Collected (ml) ~5L ✓
Sample ID? VR-032501-OUT

Y/N	Value	Storm Validation Criteria
Y	hrs. (if known)	Was there an antecedent dry period of at least six hours?
Y	0.51 in.	Was total rainfall greater than or equal to 0.25"?
Y	2+3 5 hrs.	Was runoff duration greater than one hour? (not including [illegible])

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
Y	Y % (approx.)	Was greater than 75% of the total volume of the storm sampled?
Y	27/27 # subsample	Were at least 10 sub-samples collected at the inlet?
Y	27/27 # subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. N Field blank collected? If so, Sample ID. N

NOTES (including any problems with equipment or maintenance activities performed):

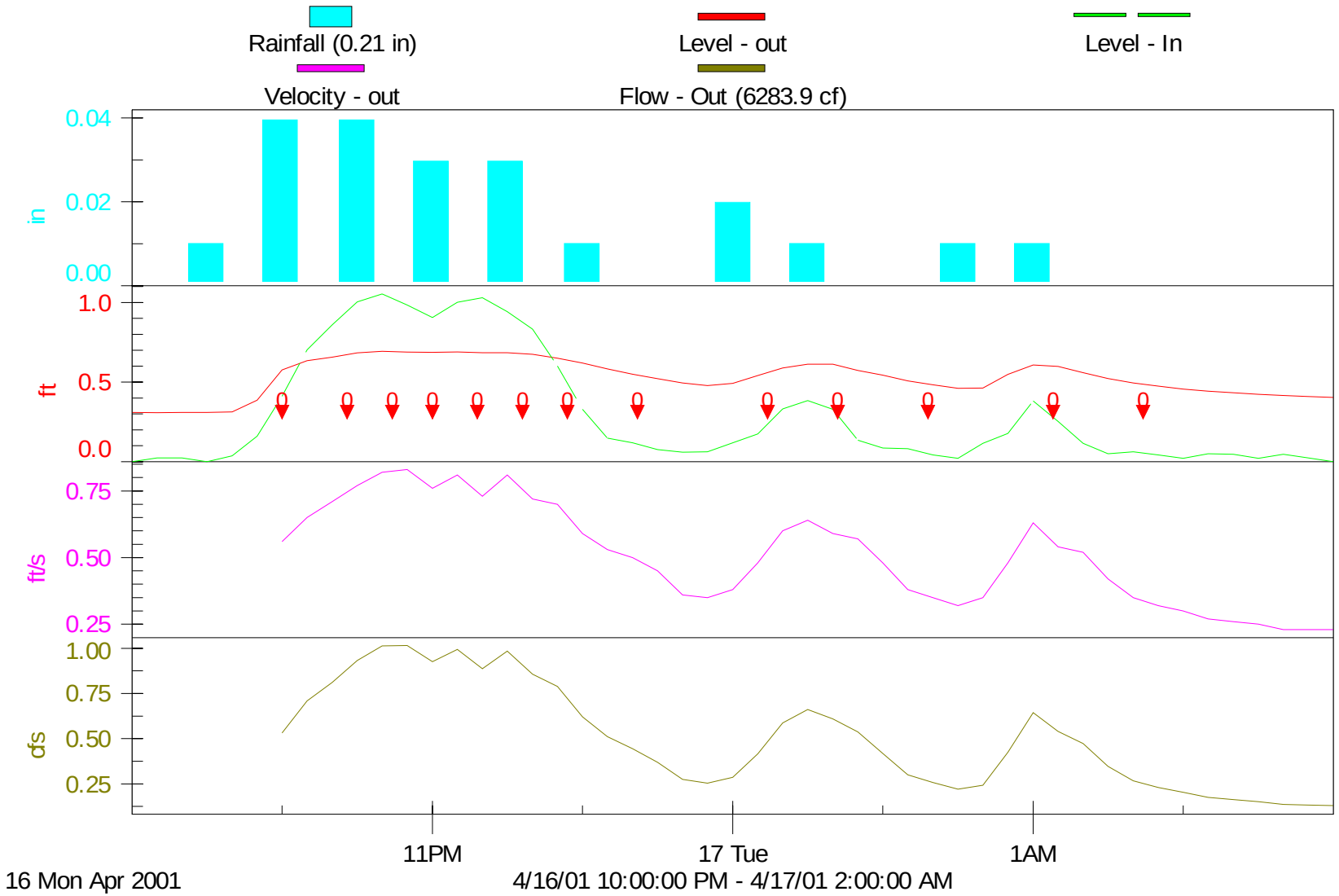
* missed sample [illegible] in back

STORM EVENT

NUMBER 2

SR 405 Vortechnics

Storm#2, 16-17 April 2001



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PROJECT NARRATIVE for B1D0427

Client: Taylor Associates
Project Manager: Ingrid Wertz
Project Name: SR405 Vortechs
Project Number: Not Provided

1.0 DESCRIPTION OF CASE

Two water sample were received for the analysis of:

- Total Zinc by EPA 200.8
- Dissolved Zinc by EPA 200.8
- Hardness by SM2340B
- Orthophosphate by EPA 365.2
- Total Phosphorous by EPA 365.2
- Total Suspended Solids by EPA 160.2
- Turbidity
- PH by EPA 150.1

2.0 COMMENTS ON SAMPLE RECEIPT

The samples were received in 5L Poly bottles then split into the appropriate sample container upon receipt then logged in on 17th April 2001 at a temperature of 12.7C. The samples were received outside the recommended temperature range of 4C ±2C but since they were received within 4 hours of collection they may not have had time to equilibrate with the coolant.

Preparation and Analysis

The dissolved metals were filtered and preserved in house with Nitric Acid. The Matrix Spike duplicate recovery was outside the method established criteria; since the remaining QC samples are acceptable this does not represent an out-of-control condition for the analytical batch. There were no anomalies associated with the remaining analyses; all QA criteria were within method established control limits.

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Amar Gill
Project Manager
North Creek Analytical

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VOR-041701-IN	B1D0427-01	Water	04/17/01 01:21	04/17/01 15:15
VOR-041701-OUT	B1D0427-02	Water	04/17/01 01:21	04/17/01 15:15

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Total Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-041701-IN (B1D0427-01) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Zinc	**0.112**	0.0100	mg/l	1	1D18019	04/18/01	04/20/01	EPA 200.8	
VOR-041701-OUT (B1D0427-02) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Zinc	**0.0921**	0.0100	mg/l	1	1D18019	04/18/01	04/20/01	EPA 200.8	

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Dissolved Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-041701-IN (B1D0427-01) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						**Q-30**
Zinc	**0.0374**	0.0100	mg/l	1	1D19018	04/19/01	04/21/01	EPA 200.8	
VOR-041701-OUT (B1D0427-02) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						**Q-30**
Zinc	**0.0316**	0.0100	mg/l	1	1D19018	04/19/01	04/21/01	EPA 200.8	

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-041701-IN (B1D0427-01) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Orthophosphate-phosphorus	**0.00375**	0.00200	mg/l	1	1D18041	04/18/01	04/18/01	EPA 365.2	
Phosphorus	**0.221**	0.0100	"	2	1D30047	04/30/01	04/30/01	"	
pH	**6.47**		pH Units	1	1D18026	04/17/01	04/17/01	EPA 150.1	
Total Suspended Solids	**140**	4.0	mg/l	"	1D20050	04/19/01	04/20/01	EPA 160.2	
Turbidity	**78.6**	2.00	NTU	2	1D19041	04/18/01	04/18/01	EPA 180.1	
VOR-041701-IN (B1D0427-01RE1) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Hardness	**32.3**	1.00	mg eq. CaCO3/L	1	1D20023	04/18/01	04/23/01	SM 2340B	
VOR-041701-OUT (B1D0427-02) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Orthophosphate-phosphorus	**0.00322**	0.00200	mg/l	1	1D18041	04/18/01	04/18/01	EPA 365.2	
Phosphorus	**0.286**	0.00500	"	"	1D27023	04/25/01	04/27/01	"	
pH	**6.56**		pH Units	"	1D18026	04/17/01	04/17/01	EPA 150.1	
Total Suspended Solids	**120**	4.0	mg/l	"	1D20050	04/19/01	04/20/01	EPA 160.2	
Turbidity	**77.6**	2.00	NTU	2	1D19041	04/18/01	04/18/01	EPA 180.1	
VOR-041701-OUT (B1D0427-02RE1) Water	**Sampled: 04/17/01 01:21**		**Received: 04/17/01 15:15**						
Hardness	**36.2**	1.00	mg eq. CaCO3/L	1	1D20023	04/18/01	04/23/01	SM 2340B	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Total Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D18019: Prepared 04/18/01 Using EPA 200 Series										
Blank (1D18019-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1D18019-BS1)										
Zinc	0.206	0.0100	mg/l	0.200		103	85-115			
Matrix Spike (1D18019-MS1)					**Source: B1D0398-01**					
Zinc	0.192	0.0100	mg/l	0.200	ND	93.2	75-125			
Matrix Spike Dup (1D18019-MSD1)					**Source: B1D0398-01**					
Zinc	0.197	0.0100	mg/l	0.200	ND	95.7	75-125	2.57	20	

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Dissolved Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D19018: Prepared 04/19/01 Using EPA 3005A										
Blank (1D19018-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1D19018-BS1)										
Zinc	0.204	0.0100	mg/l	0.200		102	85-115			
Matrix Spike (1D19018-MS1)					**Source: B1D0199-02**					
Zinc	0.181	0.0100	mg/l	0.200	0.0103	85.4	75-125			
Matrix Spike Dup (1D19018-MSD1)					**Source: B1D0199-02**					
Zinc	0.186	0.0100	mg/l	0.200	0.0103	87.8	75-125	2.72	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D18026: Prepared 04/17/01 Using General Preparation										
Duplicate (1D18026-DUP1)					**Source: B1D0414-01**					
pH	6.71		pH Units		6.68			0.448	10	
Batch 1D18041: Prepared 04/18/01 Using General Preparation										
Blank (1D18041-BLK1)										
Orthophosphate-phosphorus	ND	0.00200	mg/l							
LCS (1D18041-BS1)										
Orthophosphate-phosphorus	0.0524	0.00200	mg/l	0.0500		105	90-110			
Matrix Spike (1D18041-MS1)					**Source: B1D0427-02**					
Orthophosphate-phosphorus	0.0535	0.00200	mg/l	0.0500	0.00322	101	80-120			
Matrix Spike Dup (1D18041-MSD1)					**Source: B1D0427-02**					
Orthophosphate-phosphorus	0.0538	0.00200	mg/l	0.0500	0.00322	101	80-120	0.559	25	
Batch 1D19041: Prepared 04/18/01 Using General Preparation										
Blank (1D19041-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (1D19041-BS1)										
Turbidity	21.8	1.00	NTU	20.0		109	90-110			
Duplicate (1D19041-DUP1)					**Source: B1D0451-04**					
Turbidity	ND	1.00	NTU		ND			10.5	20	

Amar Gill, Project Manager

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541.383.9310 fax 541.382.7588

Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D20023: Prepared 04/20/01 Using EPA 3010A										
Blank (1D20023-BLK1)										
Hardness	ND	1.00	mg eq. CaCO3/L							
LCS (1D20023-BS1)										
Hardness	71.8	1.00	mg eq. CaCO3/L	66.2		108	70-130			
Matrix Spike (1D20023-MS1)					**Source: B1D0199-02RE1**					
Hardness	306	1.00	mg eq. CaCO3/L	66.2	244	93.7	75-125			
Matrix Spike Dup (1D20023-MSD1)					**Source: B1D0199-02RE1**					
Hardness	309	1.00	mg eq. CaCO3/L	66.2	244	98.2	75-125	0.976	20	
Batch 1D20050: Prepared 04/19/01 Using General Preparation										
Blank (1D20050-BLK1)										
otal Suspended Solids	ND	4.0	mg/l							
Duplicate (1D20050-DUP1)					**Source: B1D0420-01**					
Total Suspended Solids	37	4.0	mg/l		40			7.8	19	
Batch 1D27023: Prepared 04/25/01 Using General Preparation										
Blank (1D27023-BLK1)										
Phosphorus	ND	0.00500	mg/l							
LCS (1D27023-BS1)										
Phosphorus	0.0532	0.00500	mg/l	0.0500		106	90-120			

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1D27023: Prepared 04/25/01 Using General Preparation										
Matrix Spike (1D27023-MS1)					**Source: B1D0438-04**					
Phosphorus	0.406	0.0100	mg/l	0.0500	0.355	102	60-139			
Matrix Spike Dup (1D27023-MSD1)					**Source: B1D0438-04**					
Phosphorus	0.416	0.0100	mg/l	0.0500	0.355	122	60-139	2.43	25	
Batch 1D30047: Prepared 04/30/01 Using General Preparation										
Blank (1D30047-BLK1)										
Phosphorus	ND	0.00500	mg/l							
LCS (1D30047-BS1)										
Phosphorus	0.0524	0.00500	mg/l	0.0500		105	90-120			
Matrix Spike (1D30047-MS1)					**Source: B1D0427-01**					
Phosphorus	0.336	0.0100	mg/l	0.100	0.221	115	60-139			
Matrix Spike Dup (1D30047-MSD1)					**Source: B1D0427-01**					
Phosphorus	0.383	0.0100	mg/l	0.100	0.221	162	60-139	13.1	25	Q-01

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/01/01 17:12

Notes and Definitions

Q-01	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
Q-30	This sample was laboratory filtered since it was not field filtered as is required by the methodology.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

WO# BIDO427

CHAIN OF CUSTODY RECORD

Sample Collection by: TAYLOR ASSOCIATES
Contact: Ingrid Wertz
Tel: 206.633.4486

Client: WSDOT
Contact: Naomi Chechowitz
Tel: 206.440.4602

Laboratory: North Creek Analytical
Contact: Amar Gill
Tel: 425.420.9232

or University of Washington
Contact: David Stensel
Tel: 206.543.9358

Page: 1 of 1
Project ID: SR405 Vortechs
Case File #:
Date recorded by:

standard turnaround

SR405 Vortechs™ Monitoring Project

Sample ID	Date Collected	Time* Collected	Comp?	Grab?	# of contain.	matrix	TSS	Turbidity	Hardness	Total Zn	Dissolved Zn	TP	Ortho-P	TSS	Other? pH	Other?	Notes
VOR-041701-IN	4/17/01	1:21 pm	✓		1	W	✓	✓	✓	✓	✓	✓	✓		✓		
VOR-041701-OUT	4/17/01	1:21 pm	✓		1	W	✓	✓	✓	✓	✓	✓	✓		✓		

Comments/Special Notes:
*Time last subsample of composite collected

Relinquished by:	In.	Relinquished by:
Signature	Ingrid Wertz	Signature
Printed Name	Ingrid Wertz	Printed Name
Company	Taylor Associates	Company
Date/Time	4/17/01 15:15	Date/Time
Received by:	[illegible]	Received by:
Signature		Signature
Printed Name	PRANY TONG	Printed Name
Company	NCA	Company
Date/Time	4/17/01 15:15	Date/Time

w/o 12.7

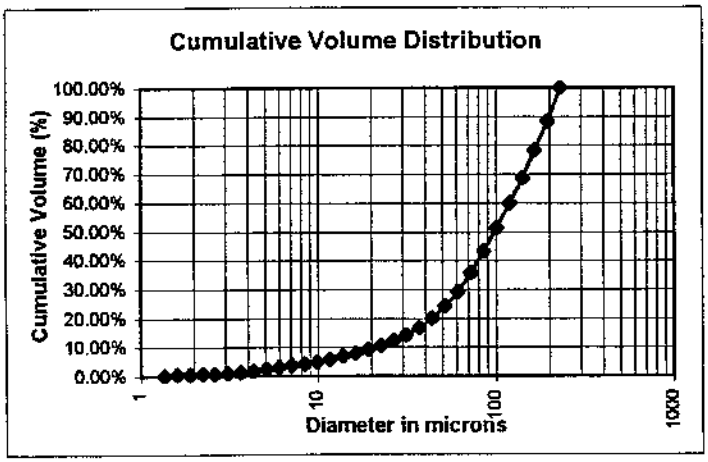
SAMPLES WERE NOT 2-6C UPON RECEIPT

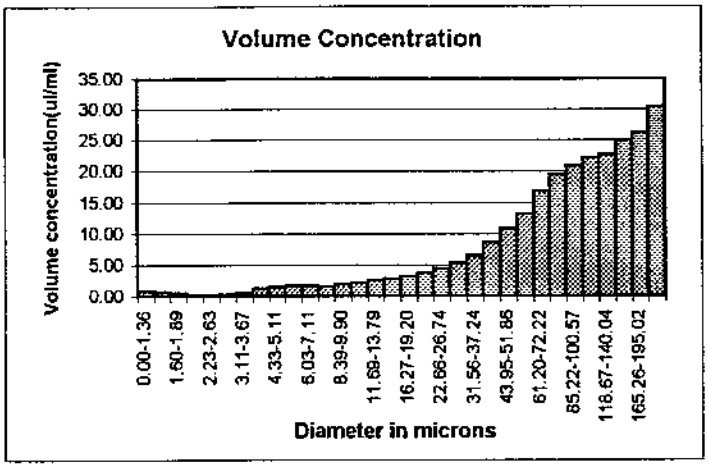
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago, Joyce Chang
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID: SR 405 - Vortechs
Sample ID: VOR-041701-IN
Date and Time Collected: 4/17/01 1:21am
Date and Time of PSD Analysis: 4/19/01 8:34am





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	0.86	0.33%	0.13
1.36-1.60	0.68	0.59%	0.10
1.60-1.89	0.47	0.78%	0.07
1.89-2.23	0.31	0.90%	0.05
2.23-2.63	0.24	0.99%	0.04
2.63-3.11	0.31	1.11%	0.05
3.11-3.67	0.66	1.36%	0.10
3.67-4.33	1.23	1.83%	0.18
4.33-5.11	1.48	2.41%	0.22
5.11-6.03	1.71	3.06%	0.25
6.03-7.11	1.67	3.71%	0.25
7.11-8.39	1.57	4.31%	0.23
8.39-9.90	1.83	5.02%	0.27
9.90-11.69	2.14	5.84%	0.32
11.69-13.79	2.62	6.85%	0.39
13.79-16.27	2.77	7.92%	0.41
16.27-19.20	3.22	9.16%	0.47
19.20-22.66	3.69	10.58%	0.54
22.66-26.74	4.43	12.29%	0.65
26.74-31.56	5.26	14.31%	0.77
31.56-37.24	6.57	16.84%	0.97
37.24-43.95	8.60	20.15%	1.27
43.95-51.86	10.81	24.32%	1.59
51.86-61.20	13.18	29.39%	1.94
61.20-72.22	16.87	35.89%	2.48
72.22-85.22	19.49	43.40%	2.87
85.22-100.57	20.83	51.42%	3.06
100.57-118.67	22.09	59.92%	3.25
118.67-140.04	22.65	68.64%	3.33
140.04-165.26	24.91	78.24%	3.66
165.26-195.02	26.12	88.30%	3.84
195.02-230.14	30.40	100.00%	4.47
Total	259.69		38.20

Computed Statistics:
Weight Mean = 113.88 microns
D_{10} = 19.20 microns
D_{50} = 85.22 microns
D_{90} = 195.02 microns

Size Range (microns)	Mass of TSS (mg)	% Mass
< 212	38.20	79.75%
212-425	5.70	11.90%
425-850	1.50	3.13%
>850	2.50	5.22%
Total	47.90	100.00%

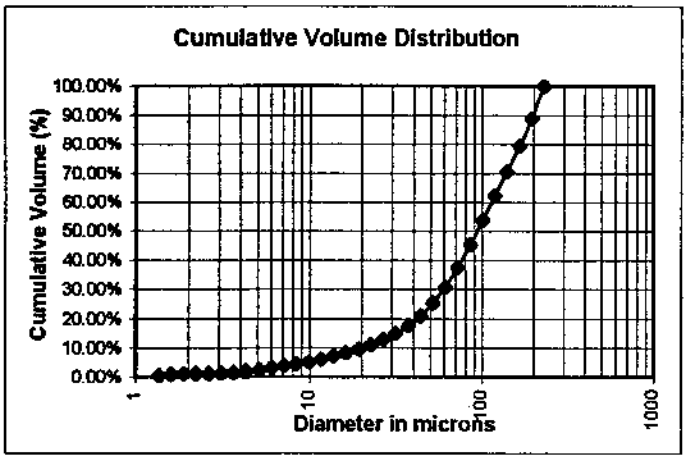
Volume of Sample: 400 ml
Volume of Dilution: 0 ml added
Comments: The 48-hour holding time was not met. VSS was not measured.

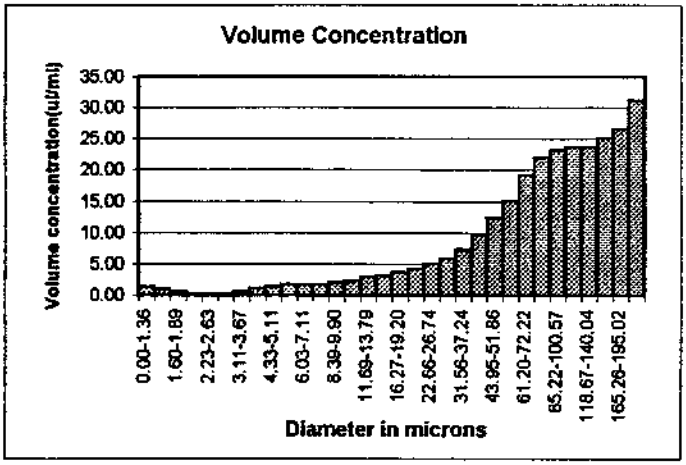
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago, Joyce Chang
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID: SR 405 - Vortechs
Sample ID: VOR-041701-OUT
Date and Time Collected: 4/17/01 1:21am
Date and Time of PSD Analysis: 4/19/01 10:08am





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	1.33	0.47%	0.17
1.36-1.60	0.95	0.81%	0.12
1.60-1.89	0.58	1.02%	0.08
1.89-2.23	0.33	1.13%	0.04
2.23-2.63	0.22	1.21%	0.03
2.63-3.11	0.27	1.31%	0.04
3.11-3.67	0.62	1.53%	0.08
3.67-4.33	1.16	1.94%	0.15
4.33-5.11	1.42	2.45%	0.19
5.11-6.03	1.80	3.09%	0.24
6.03-7.11	1.82	3.73%	0.24
7.11-8.39	1.78	4.37%	0.23
8.39-9.90	2.06	5.10%	0.27
9.90-11.69	2.42	5.96%	0.32
11.69-13.79	2.99	7.02%	0.39
13.79-16.27	3.22	8.16%	0.42
16.27-19.20	3.77	9.50%	0.49
19.20-22.66	4.30	11.03%	0.56
22.66-26.74	5.11	12.85%	0.67
26.74-31.56	5.95	14.96%	0.78
31.56-37.24	7.42	17.60%	0.97
37.24-43.95	9.70	21.05%	1.27
43.95-51.86	12.32	25.43%	1.62
51.86-61.20	15.02	30.77%	1.97
61.20-72.22	19.26	37.62%	2.53
72.22-85.22	22.05	45.46%	2.89
85.22-100.57	23.17	53.70%	3.04
100.57-118.67	23.72	62.13%	3.11
118.67-140.04	23.68	70.55%	3.11
140.04-165.26	25.12	79.49%	3.30
165.26-195.02	26.54	88.93%	3.48
195.02-230.14	31.14	100.00%	4.09
Total	281.22		36.90

Computed Statistics:
Weight Mean = 110.88 microns
D_{10} = 19.20 microns
D_{50} = 85.22 microns
D_{90} = 195.02 microns

Size Range (microns)	Mass of TSS (mg)	% Mass
< 212	36.90	83.30%
212-425	3.70	8.35%
425-850	2.30	5.19%
>850	1.40	3.16%
Total	44.30	100.00%

Volume of Sample: 420 ml
Volume of Dilution: 0 ml added
Comments: The 48-hour holding time was not met. VSS was not measured.

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 4/16/?1 Field Staff IU/OS Weather overcast ~60°

~~Pre-Strom Visit~~ - or - Post-Storm Visit (circle one)

INLET		OUTLET	
Check Current Readings / Download:		**Check Current Readings / Download:**	
ISCO Time? reset (Y/N)?	✓ - N	ISCO Time? reset (Y/N)?	✓ - N
Time downloaded	—	Level (ft.)	.1309 ✓
	0.013' slight head	Velocity (f/s)	0.20
		Flow (cfs)	0.0
		Total Flow (cf)	5203
		Sig/Spec str.	0/0
		Time downloaded	—

Pre - Storm Visit

INLET		OUTLET	
Battery (V)	12.3	Battery (V)	12.6
Clean bottle (Y/N)?	Y	Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y/N	Pump tubing ok (Y/N)? Replaced?	Y/N
Sampler tubing ok (Y/N)?	Y/N	Sampler tubing ok (Y/N)?	Y/N
Strainer ok? around strainer	Y	Strainer ok?	Y
Ext. desiccant ok (Y/N)? Changed?	N/N	Ext. desiccant ok (Y/N)? Changed?	Y/N
Int. desiccant ok (Y/N)? Changed?	Y/N	Int. desiccant ok (Y/N)? Changed?	Y/N
Measure Dn level? Ok?	✓	Measure Dn level? Ok?	✓
Sample Volume (ml)	200 ml	Enable level (ft)	.0.150
Inspect Rain Gage	✓	Pacing (cf) / Sample Volume (ml)	600 cf / 200 ml
Sampler enabled	Y	Sample Enabled?	Y

Post - Storm Visit

INLET		OUTLET	
Equipment Ran Completely?		Equipment Ran Completely?	
Sampler Enabled (date/time)?		Sampler Enabled (date/time)?	
Composite Began (date/time)?		Composite Began (date/time)?	
Number of subsamples taken?		Number of subsamples taken?	
Any subsample collection errors?		Any subsample collection errors?	
Last Sample (date/time)?		Last Sample (date/time)?	
Est. Sample Volume Collected (ml)		Est. Sample Volume Collected (ml)	
Sample ID?		Sample ID?	

Y/N	Value	Storm Validation Criteria
	hrs. (if known)	Was there an antecedent dry period of at least six hours?
	in.	Was total rainfall greater than or equal to 0.25"?
	hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
	# subsample	Were at least 10 sub-samples collected at the inlet?
	# subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. ______ Field blank collected? If so, Sample ID. ______

NOTES (including any problems with equipment or maintenance activities performed):

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 4/17/01 Field Staff IW Weather overcast ~55°

Pre-Strom Visit - or - Post-Storm Visit (circle one)

Pre - Storm Visit

INLET

Check Current Readings / Download:

ISCO	Time? reset (Y/N)?	✓
	Time downloaded	13:46
	Lev	.026

OUTLET

Check Current Readings / Download:

ISCO	Time? reset (Y/N)?	✓
	Level (ft.)	0.322
	Velocity (f/s)	*0.23*
	Flow (cfs)	*.009
	Total Flow (cf)	6360
	Sig/Spec str.	D/Lev
	Time downloaded	13:36

INLET

Battery (V)	
Clean bottle (Y/N)?	
Pump tubing ok (Y/N)? Replaced?	
Sampler tubing ok (Y/N)?	
Strainer ok?	
Ext. desiccant ok (Y/N)? Changed?	
Int. desiccant ok (Y/N)? Changed?	
Measure Dn level? Ok?	
Sample Volume (ml)	
Inspect Rain Gage	
Sampler enabled	

OUTLET

Battery (V)	
Clean bottle (Y/N)?	
Pump tubing ok (Y/N)? Replaced?	
Sampler tubing ok (Y/N)?	
Strainer ok?	
Ext. desiccant ok (Y/N)? Changed?	
Int. desiccant ok (Y/N)? Changed?	
Measure Dn level? Ok?	
Enable level (ft)	
Pacing (cf) / Sample Volume (ml)	
Sample Enabled?	

Post - Storm Visit

INLET

Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	"see back"
Composite Began (date/time)?	" "
Number of subsamples taken?	13
Any subsample collection errors?	no
Last Sample (date/time)?	4/17 1:21
Est. Sample Volume Collected (ml)	2600
Sample ID?	

OUTLET

Equipment Ran Completely?	✓
Sampler Enabled (date/time)?	"see back"
Composite Began (date/time)?	" "
Number of subsamples taken?	13
Any subsample collection errors?	no
Last Sample (date/time)?	4/17 1:22
Est. Sample Volume Collected (ml)	2900 ml
Sample ID?	

Y/N	Value	Storm Validation Criteria
✓	hrs. (if known)	Was there an antecedent dry period of at least six hours? >8hrs based on SR405,
✓	.21 * in.	Was total rainfall greater than or equal to 0.25"?
✓	3.5 hrs.	Was runoff duration greater than one hour? ✓

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
✓	~100 % (approx.)	Was greater than 75% of the total volume of the storm sampled?
✓	13 # subsample	Were at least 10 sub-samples collected at the inlet?
✓	13 # subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. N Field blank collected? If so, Sample ID. N

NOTES (including any problems with equipment or maintenance activities performed):

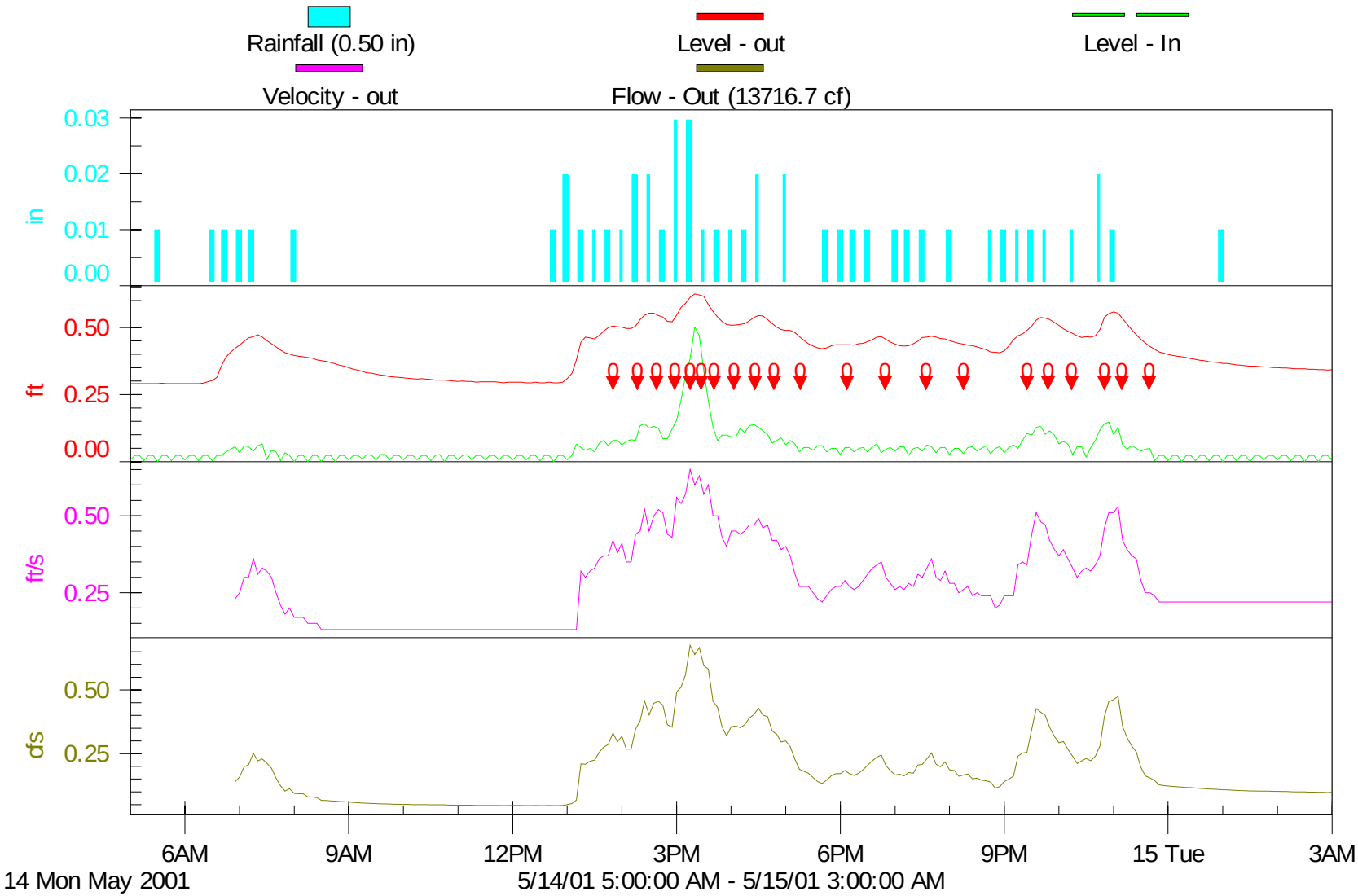
* accepted since high intensity storm with desired flow rates.

STORM EVENT

NUMBER 3

SR 405 Vortechnics

Storm#3, 14-15 May 2001



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Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

PROJECT NARRATIVE for B1E0386

Client: Taylor Associates
Project Manager: Ingrid Wertz
Project Name: SR405 Vortechs
Project Number: Not Provided

1.0 DESCRIPTION OF CASE

Two water sample were received for the analysis of:

- Total Zinc by EPA 200.8
- Dissolved Zinc by EPA 200.8
- Hardness by SM2340B
- Orthophosphate by EPA 365.2
- Total Phosphorous by EPA 365.2
- Total Suspended Solids by EPA 160.2
- Turbidity
- PH by EPA 150.1

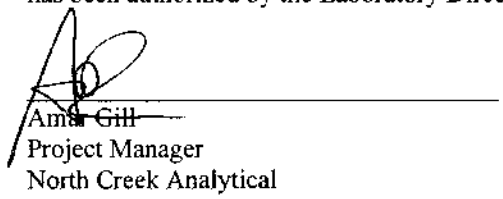
2.0 COMMENTS ON SAMPLE RECEIPT

The samples were received in 5L Poly bottles then split into the appropriate sample container upon receipt then logged in on 15th May 2001 at a temperature of 17.9C. The samples were received outside the recommended temperature range of 4C ±2C.

Preparation and Analysis

The dissolved metals were filtered in house and preserved with Nitric Acid. All analyses and batch QA were within method established criteria except for the Matrix Spike and Matrix Spike Duplicate for the Total Zinc analysis batch. Since this was due to a matrix effect and the Blank and Blank Spike recovery were within method established limits this does not represent an out-of-control condition for the analytical batch.

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."



Amy Gill
Project Manager
North Creek Analytical

www.ncalabs.com

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VOR-051401-IN	B1E0386-01	Water	05/14/01 23:38	05/15/01 14:40
VOR-051401-OUT	B1E0386-02	Water	05/14/01 23:39	05/15/01 14:40
VOR-051401-FB	B1E0386-03	Water	05/15/01 13:00	05/15/01 14:40

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541.383.9310 fax 541.382.7588

Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Total Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-051401-IN (B1E0386-01) Water	**Sampled: 05/14/01 23:38**		**Received: 05/15/01 14:40**						
Zinc	**0.0812**	0.0100	mg/l	1	1E17017	05/17/01	05/21/01	EPA 200.8	
VOR-051401-OUT (B1E0386-02) Water	**Sampled: 05/14/01 23:39**		**Received: 05/15/01 14:40**						
Zinc	**0.0733**	0.0100	mg/l	1	1E17017	05/17/01	05/21/01	EPA 200.8	
VOR-051401-FB (B1E0386-03) Water	**Sampled: 05/15/01 13:00**		**Received: 05/15/01 14:40**						
Zinc	ND	0.0100	mg/l	1	1E17017	05/17/01	05/21/01	EPA 200.8	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Dissolved Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-051401-IN (B1E0386-01) Water	**Sampled: 05/14/01 23:38**		**Received: 05/15/01 14:40**						
Zinc	**0.0397**	0.0100	mg/l	1	1E21029	05/21/01	05/21/01	EPA 200.8	
VOR-051401-OUT (B1E0386-02) Water	**Sampled: 05/14/01 23:39**		**Received: 05/15/01 14:40**						
Zinc	**0.0400**	0.0100	mg/l	1	1E21029	05/21/01	05/21/01	EPA 200.8	
VOR-051401-FB (B1E0386-03) Water	**Sampled: 05/15/01 13:00**		**Received: 05/15/01 14:40**						
Zinc	ND	0.0100	mg/l	1	1E21029	05/21/01	05/21/01	EPA 200.8	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-051401-IN (B1E0386-01) Water Sampled: 05/14/01 23:38 Received: 05/15/01 14:40									
Hardness	**27.3**	1.00	mg eq. CaCO3/L	1	1E25034	05/25/01	05/30/01	SM 2340B	
Orthophosphate-phosphorus	**0.00375**	0.00200	mg/l	"	1E17009	05/16/01	05/16/01	EPA 365.2	
Phosphorus	**0.0742**	0.00500	"	"	1E22021	05/22/01	05/23/01	"	
pH	**7.01**		pH Units	"	1E16039	05/15/01	05/15/01	EPA 150.1	
Total Suspended Solids	**55**	4.0	mg/l	"	1E18013	05/16/01	05/18/01	EPA 160.2	
Turbidity	**37.6**	1.00	NTU	"	1E16040	05/15/01	05/15/01	EPA 180.1	
VOR-051401-OUT (B1E0386-02) Water Sampled: 05/14/01 23:39 Received: 05/15/01 14:40									
Hardness	**27.9**	1.00	mg eq. CaCO3/L	1	1E25034	05/25/01	05/30/01	SM 2340B	
Orthophosphate-phosphorus	**0.00349**	0.00200	mg/l	"	1E17009	05/16/01	05/16/01	EPA 365.2	
Phosphorus	**0.0892**	0.00500	"	"	1E22021	05/22/01	05/23/01	"	
pH	**6.86**		pH Units	"	1E16039	05/15/01	05/15/01	EPA 150.1	
Total Suspended Solids	**44**	4.0	mg/l	"	1E18013	05/16/01	05/18/01	EPA 160.2	
Turbidity	**57.6**	2.00	NTU	2	1E16040	05/15/01	05/15/01	EPA 180.1	
OR-051401-FB (B1E0386-03) Water Sampled: 05/15/01 13:00 Received: 05/15/01 14:40									
Hardness	ND	1.00	mg eq. CaCO3/L	1	1E25034	05/25/01	05/30/01	SM 2340B	
Orthophosphate-phosphorus	**0.00429**	0.00200	mg/l	"	1E17009	05/16/01	05/16/01	EPA 365.2	
Phosphorus	ND	0.00500	"	"	1E22021	05/22/01	05/23/01	"	
pH	**5.55**		pH Units	"	1E16039	05/15/01	05/15/01	EPA 150.1	
Total Suspended Solids	ND	4.0	mg/l	"	1E18013	05/16/01	05/18/01	EPA 160.2	
Turbidity	ND	1.00	NTU	"	1E16040	05/15/01	05/15/01	EPA 180.1	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Total Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E17017: Prepared 05/17/01 Using EPA 200 Series										
Blank (1E17017-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1E17017-BS1)										
Zinc	0.208	0.0100	mg/l	0.200		104	85-115			
Matrix Spike (1E17017-MS1)					**Source: B1E0294-01**					
Zinc	1.94	0.100	mg/l	0.200	1.57	185	75-125			Q-15
Matrix Spike Dup (1E17017-MSD1)					**Source: B1E0294-01**					
Zinc	1.90	0.100	mg/l	0.200	1.57	165	75-125	2.08	20	Q-15

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Dissolved Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E21029: Prepared 05/21/01 Using EPA 3005A										
Blank (1E21029-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1E21029-BS1)										
Zinc	0.201	0.0100	mg/l	0.200		100	85-115			
Matrix Spike (1E21029-MS1)					**Source: B1E0216-07**					
Zinc	0.187	0.0100	mg/l	0.200	ND	91.8	75-125			
Matrix Spike Dup (1E21029-MSD1)					**Source: B1E0216-07**					
Zinc	0.191	0.0100	mg/l	0.200	ND	93.8	75-125	2.12	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E16039: Prepared 05/15/01 Using General Preparation										
Duplicate (1E16039-DUP1)					**Source: B1E0376-01**					
pH	6.25		pH Units		6.29			0.638	10	
Batch 1E16040: Prepared 05/15/01 Using General Preparation										
Blank (1E16040-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (1E16040-BS1)										
Turbidity	21.5	1.00	NTU	20.0		108	90-110			
Duplicate (1E16040-DUP1)					**Source: B1E0386-03**					
Turbidity	ND	1.00	NTU		ND			32.0	20	
Batch 1E17009: Prepared 05/16/01 Using General Preparation										
lank (1E17009-BLK1)										
Orthophosphate-phosphorus	ND	0.00200	mg/l							
LCS (1E17009-BS1)										
Orthophosphate-phosphorus	0.0498	0.00200	mg/l	0.0500		99.6	90-110			
Matrix Spike (1E17009-MS1)					**Source: B1E0398-03**					
Orthophosphate-phosphorus	0.0628	0.00200	mg/l	0.0500	0.0101	105	80-120			
Matrix Spike Dup (1E17009-MSD1)					**Source: B1E0398-03**					
Orthophosphate-phosphorus	0.0634	0.00200	mg/l	0.0500	0.0101	107	80-120	0.951	25	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E18013: Prepared 05/16/01 Using General Preparation										
Blank (1E18013-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (1E18013-DUP1)					Source: B1E0384-01					
Total Suspended Solids	17	4.0	mg/l		16			6.1	19	
Batch 1E22021: Prepared 05/22/01 Using General Preparation										
Blank (1E22021-BLK1)										
Phosphorus	ND	0.00500	mg/l							
LCS (1E22021-BS1)										
Phosphorus	0.0501	0.00500	mg/l	0.0500		100	90-120			
LCS Dup (1E22021-BSD1)										
osphorus	0.0518	0.00500	mg/l	0.0500		104	90-120	3.34	20	
Matrix Spike (1E22021-MS1)					Source: B1E0398-10					
Phosphorus	0.0572	0.00500	mg/l	0.0500	0.0153	83.8	60-139			
Matrix Spike Dup (1E22021-MSD1)					Source: B1E0398-10					
Phosphorus	0.0603	0.00500	mg/l	0.0500	0.0153	90.0	60-139	5.28	25	
Batch 1E25034: Prepared 05/25/01 Using EPA 3010A										
Blank (1E25034-BLK1)										
Hardness	ND	1.00	mg eq. CaCO3/L							

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E25034: Prepared 05/25/01 Using EPA 3010A										
LCS (1E25034-BS1)										
Hardness	69.6	1.00	mg eq. CaCO3/L	66.2		105	70-130			
Matrix Spike (1E25034-MS1)					**Source: B1E0531-06**					
Hardness	106	1.00	mg eq. CaCO3/L	66.2	38.7	102	75-125			
Matrix Spike Dup (1E25034-MSD1)					**Source: B1E0531-06**					
Hardness	112	1.00	mg eq. CaCO3/L	66.2	38.7	111	75-125	5.50	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA, 98103	Project Manager: Ingrid Wertz	05/30/01 17:23

Notes and Definitions

Q-15	Analyses are not controlled on matrix spike RPD and/or percent recoveries when the sample concentration is significantly higher than the spike level.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

BIE0386

CHAIN OF CUSTODY RECORD

Sample Collection by: TAYLOR ASSOCIATES
Contact: Ingrid Wertz
Tel: 206.633.4486

Client: WSDOT
Contact: Naomi Chechowitz
Tel: 206.440.4602

Page: 1 of 1
Project ID: Vortechs - SR405
Case File #:
Date recorded by:

Standrd Turnround

Laboratory: North Creek Analytical
Contact: Amar Gill
Tel: 425.420.9232

or

University of Washington
Contact: David Stensel
Tel: 206.543.9358

SR405 Vortechs™ Monitoring Project

Sample ID	Date Collected	Time * Collected	Comp?	Grab?	# of contain.	matrix	Analysis Required: TSS	Turbidity	Hardness	Total Zn	Dissolved Zn	TP	Ortho-P	[illegible]	Other? pH	Other?	Notes
VOR-051401-IN	5/14/01	23:38	✓		3	W	✓	✓	✓	✓	✓	✓	✓		✓		BIE0386-01
VOR-051401-OUT	5/14/01	23:39	✓		3	W	✓	✓	✓	✓	✓	✓	✓		✓		-02
VOR-051401-FB	5/15/01	13:00		✓	3	W	✓	✓	✓	✓	✓	✓	✓		✓		-03

Comments/Special Notes:

* Time of last subsample collection for composites.

SAMPLES WERE NOT @ 2-8C UPON RECEIPT

Relinquished by:		Relinquished by:
Signature	Ingrid Wertz	Signature
Printed Name	Ingrid Wertz	Printed Name
Company	Taylor Assoc.	Company
Date/Time	5/15/01 14:40	Date/Time
Received by:		Received by:
Signature	Grady Tonts	Signature
Printed Name	GRADY TONTS	Printed Name
Company	NCA	Company
Date/Time	5/15/01 1440	Date/Time

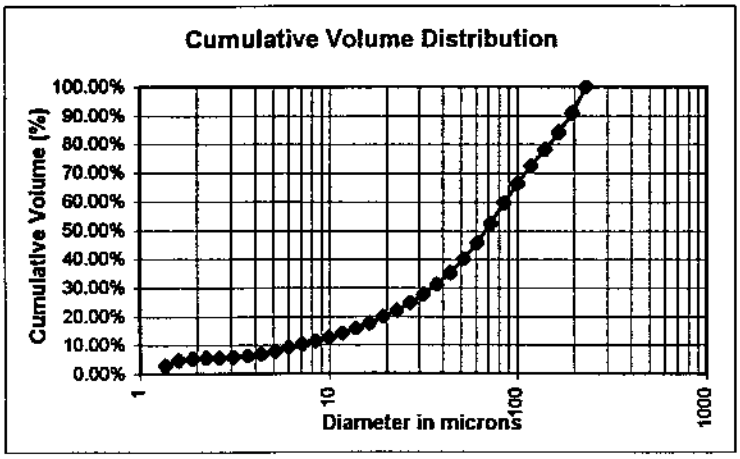
17.9° W/n

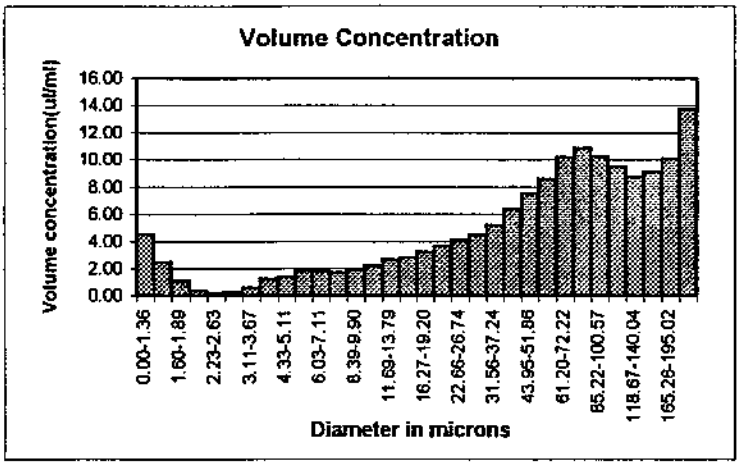
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	SR405 - Vortechs	
Sample ID:	VOR-051401-IN	
Date and Time Collected:	5/14/01	11:38pm
Date and Time of PSD Analysis:	5/16/01	10:52am





Size Range (microns)	Volume Concentration (ul/l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	4.53	2.97%	0.82
1.36-1.60	2.49	4.60%	0.45
1.60-1.89	1.08	5.31%	0.20
1.89-2.23	0.40	5.57%	0.07
2.23-2.63	0.19	5.69%	0.03
2.63-3.11	0.21	5.83%	0.04
3.11-3.67	0.59	6.22%	0.11
3.67-4.33	1.24	7.03%	0.22
4.33-5.11	1.37	7.93%	0.25
5.11-6.03	1.84	9.13%	0.33
6.03-7.11	1.81	10.32%	0.33
7.11-8.39	1.72	11.45%	0.31
8.39-9.90	1.90	12.69%	0.35
9.90-11.69	2.19	14.13%	0.40
11.69-13.79	2.64	15.86%	0.48
13.79-16.27	2.79	17.69%	0.51
16.27-19.20	3.23	19.81%	0.59
19.20-22.66	3.65	22.21%	0.66
22.66-26.74	4.07	24.87%	0.74
26.74-31.56	4.49	27.82%	0.81
31.56-37.24	5.19	31.22%	0.94
37.24-43.95	6.35	35.38%	1.15
43.95-51.86	7.49	40.30%	1.36
51.86-61.20	8.58	45.92%	1.56
61.20-72.22	10.21	52.62%	1.85
72.22-85.22	10.85	59.73%	1.97
85.22-100.57	10.25	66.45%	1.86
100.57-118.67	9.50	72.68%	1.72
118.67-140.04	8.72	78.40%	1.58
140.04-165.26	9.11	84.37%	1.65
165.26-195.02	10.11	91.00%	1.84
195.02-230.14	13.73	100.00%	2.49
Total	152.51		27.70

Computed Statistics:

Weight Mean =	89.51 microns
D_{10} =	6.03 microns
D_{50} =	61.20 microns
D_{90} =	165.26 microns

Volume of Sample:	600 ml
Volume of Dilution:	0 ml added

Comments: The 48-hour holding time was met.

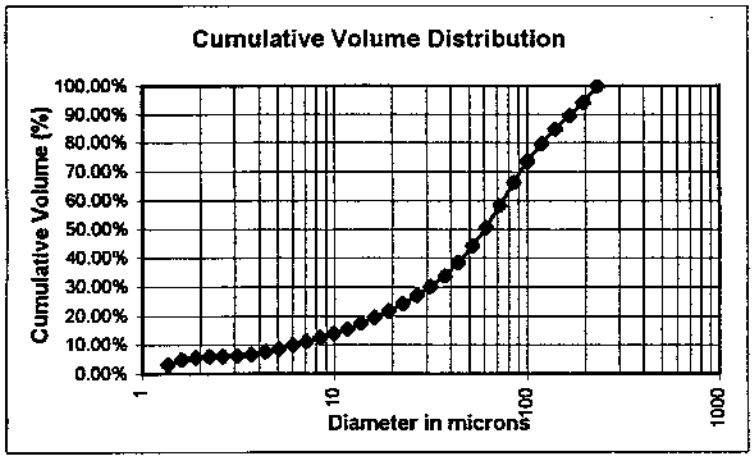
Size Range (microns)	Mass of TSS (mg)	% Mass TSS	Mass of VSS (mg)	% Mass VSS
< 212	27.70	94.86%	10.30	48.58%
212-425	0.80	2.74%	1.40	6.60%
425-850	0.40	1.37%	2.40	11.32%
>850	0.30	1.03%	7.10	33.49%
Total	29.20	100.00%	21.20	100.00%

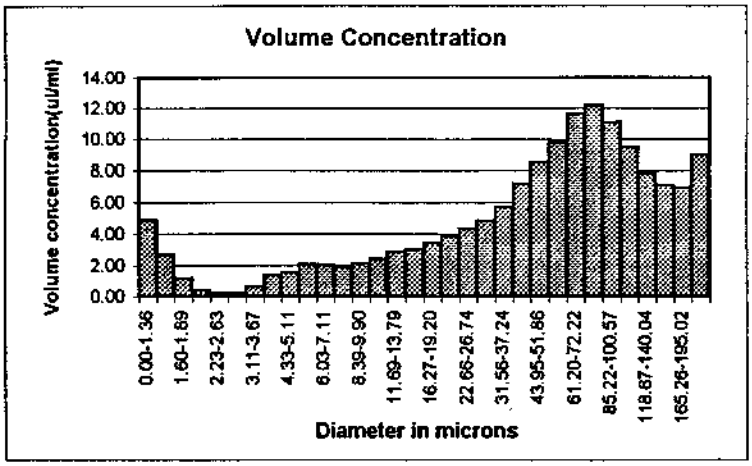
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	SR405 - Vortechs	
Sample ID:	Vor051401out	
Date & Time Collected:	5/14/01	11:39pm
Date & Time of PSD Analysis:	5/16/01	3:07pm





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	4.88	3.20%	0.99
1.36-1.60	2.66	4.94%	0.54
1.60-1.89	1.14	5.69%	0.23
1.89-2.23	0.42	5.97%	0.09
2.23-2.63	0.19	6.10%	0.04
2.63-3.11	0.23	6.24%	0.05
3.11-3.67	0.64	6.66%	0.13
3.67-4.33	1.37	7.57%	0.28
4.33-5.11	1.54	8.58%	0.31
5.11-6.03	2.07	9.94%	0.42
6.03-7.11	2.05	11.28%	0.42
7.11-8.39	1.94	12.55%	0.39
8.39-9.90	2.12	13.94%	0.43
9.90-11.69	2.42	15.53%	0.49
11.69-13.79	2.88	17.42%	0.58
13.79-16.27	3.00	19.38%	0.61
16.27-19.20	3.42	21.63%	0.70
19.20-22.66	3.84	24.14%	0.78
22.66-26.74	4.31	26.97%	0.88
26.74-31.56	4.82	30.13%	0.98
31.56-37.24	5.71	33.87%	1.16
37.24-43.95	7.19	38.59%	1.46
43.95-51.86	8.54	44.19%	1.74
51.86-61.20	9.81	50.62%	1.99
61.20-72.22	11.65	58.26%	2.37
72.22-85.22	12.17	66.24%	2.47
85.22-100.57	11.08	73.50%	2.25
100.57-118.67	9.51	79.73%	1.93
118.67-140.04	7.84	84.87%	1.59
140.04-165.26	7.11	89.53%	1.44
165.26-195.02	6.94	94.08%	1.41
195.02-230.14	9.02	100.00%	1.83
Total	152.53		31.00

Computed Statistics:

Weight Mean =	78.86 microns
D_{10} =	6.03 microns
D_{50} =	51.86 microns
D_{90} =	165.26 microns

Size Range (microns)	Mass of TSS (mg)	% Mass TSS	Mass of VSS (mg)	% Mass VSS
< 212	31.00	70.29%	11.60	57.71%
212-425	1.30	2.95%	1.10	5.47%
425-850	0.60	1.36%	1.00	4.98%
>850	11.20	25.40%	6.40	31.84%
Total	44.10	100.00%	20.10	100.00%

Volume of Sample: 700 ml
Volume of Dilution: 0 ml added

Comments: Portable was not recalibrated after IN sample.

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 5/13/01 19:00 Field Staff JW Weather Overcast

Pre-Strom Visit - or - Post-Storm Visit (circle one)

INLET			OUTLET		
Check Current Readings / Download:			**Check Current Readings / Download:**		
ISCO	Time? reset (Y/N)?	18:03 (N)	ISCO	Time? reset (Y/N)?	18:04 (N)
	Time downloaded	—		Level (ft.)	0.29'
		.026'		Velocity (f/s)	0
				Flow (cfs)	0
				Total Flow (cf)	6359.9
				Sig/Spec str.	0/0
				Time downloaded	

Pre - Storm Visit

INLET		OUTLET	
Battery (V)	12.67	Battery (V)	12.95
Clean bottle (Y/N)?	Y	Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	~~need~~ Y/N need to replace	Pump tubing ok (Y/N)? Replaced?	Y
Sampler tubing ok (Y/N)?	Y	Sampler tubing ok (Y/N)?	Y
~~Strainer ok?~~	—	~~Strainer ok?~~	
Ext. desiccant ok (Y/N)? Changed?	needs to be Dd	Ext. desiccant ok (Y/N)? Changed?	Y
Int. desiccant ok (Y/N)? Changed?	needs to be Dd	Int. desiccant ok (Y/N)? Changed?	Y - change soon
Measure Dn level? Ok?	—	Measure Dn level? Ok?	—
Sample Volume (ml)	2000	Enable level (ft)	7.5
Inspect Rain Gage	✓	Pacing (cf) / Sample Volume (ml)	500 cf / 2000 ml
Sample enabled		Sample Enabled?	

Post - Storm Visit

INLET		OUTLET	
Equipment Ran Completely?		Equipment Ran Completely?	
Sampler Enabled (date/time)?		Sampler Enabled (date/time)?	
Composite Began (date/time)?		Composite Began (date/time)?	
Number of subsamples taken?		Number of subsamples taken?	
Any subsample collection errors?		Any subsample collection errors?	
Last Sample (date/time)?		Last Sample (date/time)?	
Est. Sample Volume Collected (ml)		Est. Sample Volume Collected (ml)	
Sample ID?		Sample ID?	

Y/N	Value	Storm Validation Criteria
	hrs. (if known)	Was there an antecedent dry period of at least six hours?
	in.	Was total rainfall greater than or equal to 0.25"?
	hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
	# subsample	Were at least 10 sub-samples collected at the inlet?
	# subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. _____ Field blank collected? If so, Sample ID. _____

NOTES (including any problems with equipment or maintenance activities performed):

.50 - 4779.01

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 5/15/01 11:20 Field Staff JW Weather cloudy

Pre-Strom Visit - or - Post-Storm Visit (circle one)

INLET

Check Current Readings / Download:

ISCO
Time? reset (Y/N)? —
Time downloaded 11:30
last .020

OUTLET

Check Current Readings / Download:

ISCO
Time? reset (Y/N)? —
Level (ft.) 0.329
Velocity (f/s) * 0.22 *
Flow (cfs) * 0 *
Total Flow (cf) 11500.9
Sig/Spec str. 0/0
Time downloaded 11:20

Pre - Storm Visit

INLET

Battery (V) —
Clean bottle (Y/N)? —
Pump tubing ok (Y/N)? Replaced? —
Sampler tubing ok (Y/N)? —
Strainer ok? —
Ext. desiccant ok (Y/N)? Changed? Y
Int. desiccant ok (Y/N)? Changed? Y
Measure Dn level? Ok? —
Sample Volume (ml) —
Inspect Rain Gage —
Sampler enabled —

OUTLET

Battery (V) —
Clean bottle (Y/N)? —
Pump tubing ok (Y/N)? Replaced? —
Sampler tubing ok (Y/N)? —
Strainer ok? —
Ext. desiccant ok (Y/N)? Changed? —
Int. desiccant ok (Y/N)? Changed? Y
Measure Dn level? Ok? —
Enable level (ft) —
Pacing (cf) / Sample Volume (ml) —
Sample bubbled? —

Post - Storm Visit

INLET

Equipment Ran Completely? Y
Sampler Enabled (date/time)? 5/13 18:06
Composite Began (date/time)? 5/14 13:49
Number of subsamples taken? 21
Any subsample collection errors? NO
Last Sample (date/time)? 5/14 23:38
Est. Sample Volume Collected (ml) —
Sample ID? VOR-051401-IN

OUTLET

Equipment Ran Completely? —
Sampler Enabled (date/time)? 5/14 13:50
Composite Began (date/time)? 5/14 13:50
Number of subsamples taken? ~~5/14 23:39~~ 21
Any subsample collection errors? NO
Last Sample (date/time)? 5/14 23:39
Est. Sample Volume Collected (ml) —
Sample ID? ~~VOR-051401-IN~~ VOR-051401-UP

Y/N	Value	Storm Validation Criteria
~18	hrs. (if known)	Was there an antecedent dry period of at least six hours?
Y	0.50 in.	Was total rainfall greater than or equal to 0.25"?
Y	hrs.	Was runoff duration greater than one hour?

No rain 5/13 18:00 –

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
Y	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
Y	21 # subsample	Were at least 10 sub-samples collected at the inlet?
Y	21 # subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. N Field blank collected? If so, Sample ID. VOR-051401-FB 1500

NOTES (including any problems with equipment or maintenance activities performed):

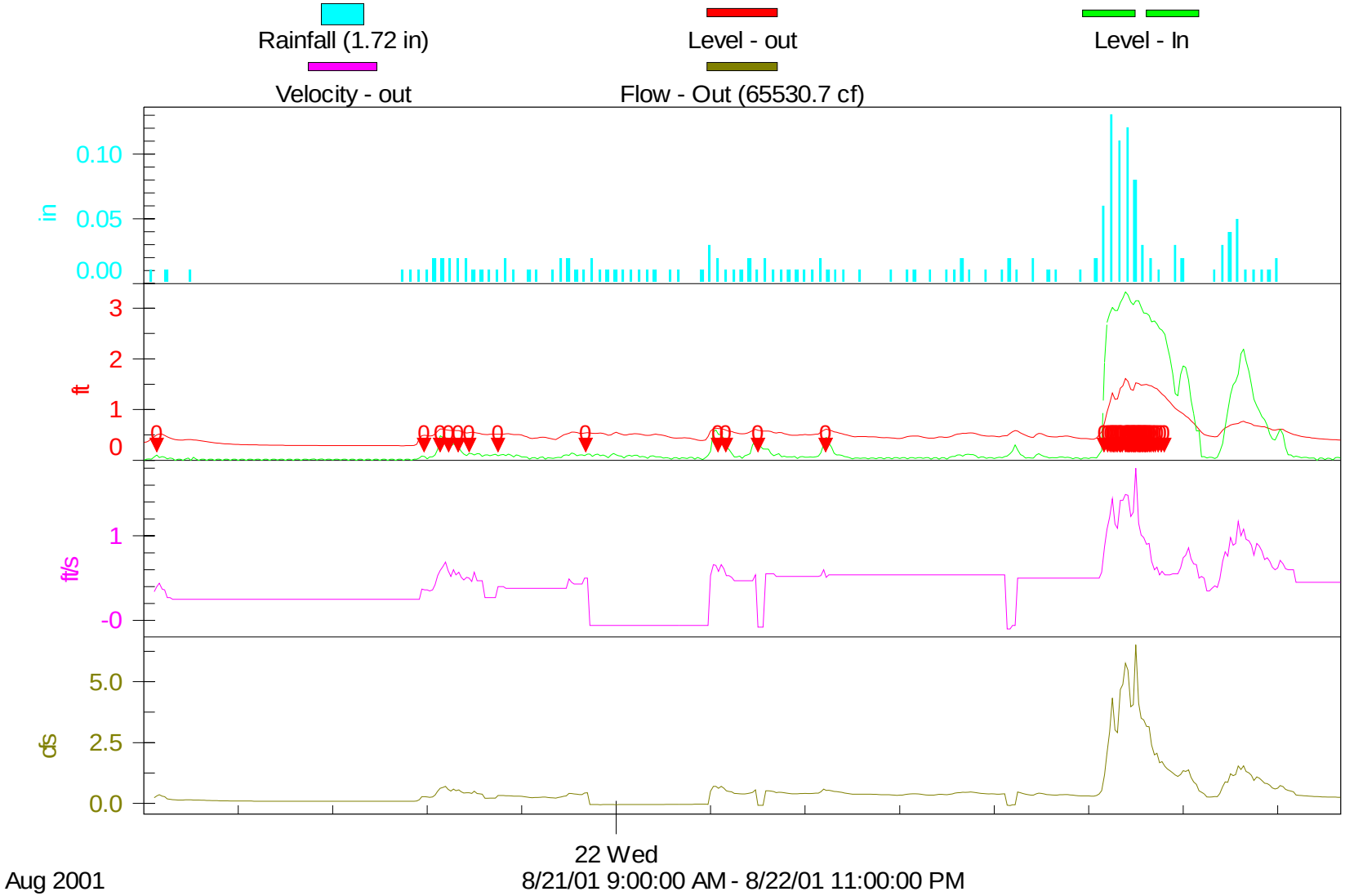
→ replaced int. desic + pump tub on inlet
→ replaced ~~ext~~ internal desic on outlet

STORM EVENT

NUMBER 4

SR 405 Vortechnics

Storm #4, 21-22 August 2001



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PROJECT NARRATIVE for B1H0531

Client: Taylor Associates
Project Manager: James Packman
Project Name: SR405 Vortechs
Project Number: Not Provided

1.0 DESCRIPTION OF CASE

Two water sample were received for the analysis of:

- Total Zinc by EPA 200.8
- Dissolved Zinc by EPA 200.8
- Hardness by SM2340B
- Orthophosphate by EPA 365.2
- Total Phosphorous by EPA 365.2
- Total Suspended Solids by EPA 160.2
- Turbidity
- pH by EPA 150.1

2.0 COMMENTS ON SAMPLE RECEIPT

The samples were received and logged in on 23rd August 2001 at a temperature of 15.8C. The samples were received outside the recommended temperature range of 4C ±2C.

Preparation and Analysis

The dissolved metals were filtered and preserved with Nitric Acid in house prior to analysis. All analyses and batch QA were within method established criteria.

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Project Manager
North Creek Analytical

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VOR-082201-IN	B1H0531-01	Water	08/22/01 17:25	08/23/01 13:30
VOR-082201-OUT	B1H0531-02	Water	08/22/01 17:24	08/23/01 13:30

North Creek Analytical - Bothell

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Total Metals by EPA 200 Series Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-082201-IN (B1H0531-01) Water	**Sampled: 08/22/01 17:25 Received: 08/23/01 13:30**								
Zinc	**0.149**	0.0100	mg/l	1	1H27018	08/27/01	08/27/01	EPA 200.8	
/OR-082201-OUT (B1H0531-02) Water	**Sampled: 08/22/01 17:24 Received: 08/23/01 13:30**								
Zinc	**0.150**	0.0100	mg/l	1	1H27018	08/27/01	08/27/01	EPA 200.8	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Dissolved Metals by EPA 200 Series Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-082201-1N (B1H0531-01) Water	**Sampled: 08/22/01 17:25**		**Received: 08/23/01 13:30**						Q-30
Zinc	**0.0190**	0.0100	mg/l	1	1I04034	09/04/01	09/05/01	EPA 200.8	
VOR-082201-OUT (B1H0531-02) Water	**Sampled: 08/22/01 17:24**		**Received: 08/23/01 13:30**						Q-30
Zinc	**0.0171**	0.0100	mg/l	1	1I04034	09/04/01	09/05/01	EPA 200.8	

North Creek Analytical - Bothell

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Conventional Chemistry Parameters by APHA/EPA Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-082201-IN (B1H0531-01) Water	**Sampled: 08/22/01 17:25 Received: 08/23/01 13:30**								
Hardness	**50.5**	1.00	mg eq. CaCO3/L	1	1H29021	08/29/01	08/30/01	SM 2340B	
Orthophosphate-phosphorus	**0.0421**	0.00200	mg/l	"	1H25010	08/23/01	08/23/01	EPA 365.2	
Phosphorus	**0.253**	0.00500	"	"	1I05027	09/04/01	09/05/01	"	
pH	**6.80**		pH Units	"	1H24046	08/23/01	08/23/01	EPA 150.1	
Total Suspended Solids	**430**	4.0	mg/l	"	1H24022	08/24/01	08/27/01	EPA 160.2	
Turbidity	**187**	10.0	NTU	10	1H25006	"	08/24/01	EPA 180.1	
VOR-082201-OUT (B1H0531-02) Water	**Sampled: 08/22/01 17:24 Received: 08/23/01 13:30**								
Hardness	**51.7**	1.00	mg eq. CaCO3/L	1	1H29021	08/29/01	08/30/01	SM 2340B	
Orthophosphate-phosphorus	**0.0376**	0.00200	mg/l	"	1H25010	08/23/01	08/23/01	EPA 365.2	
Phosphorus	**0.253**	0.00500	"	"	1I05027	09/04/01	09/05/01	"	
pH	**6.87**		pH Units	"	1H24046	08/23/01	08/23/01	EPA 150.1	
Total Suspended Solids	**310**	4.0	mg/l	"	1H24022	08/24/01	08/27/01	EPA 160.2	
Turbidity	**174**	10.0	NTU	10	1H25006	"	08/24/01	EPA 180.1	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Total Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1H27018: Prepared 08/27/01 Using EPA 200 Series										
Blank (1H27018-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1H27018-BS1)										
Zinc	0.192	0.0100	mg/l	0.200		96.0	85-115			
LCS Dup (1H27018-BSD1)										
Zinc	0.194	0.0100	mg/l	0.200		97.0	85-115	1.04	15	
Matrix Spike (1H27018-MS1)					**Source: B1H0565-01**					
Zinc	0.176	0.0100	mg/l	0.200	0.0207	77.6	75-125			
Matrix Spike Dup (1H27018-MSD1)					**Source: B1H0565-01**					
Zinc	0.180	0.0100	mg/l	0.200	0.0207	79.6	75-125	2.25	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Dissolved Metals by EPA 200 Series Methods - Quality Control

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1I04034: Prepared 09/04/01 Using EPA 3005A										
Blank (1I04034-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1I04034-BS1)										
Zinc	0.201	0.0100	mg/l	0.200		100	85-115			
LCS Dup (1I04034-BSD1)										
Zinc	0.195	0.0100	mg/l	0.200		97.5	85-115	3.03	15	
Matrix Spike (1I04034-MS1)					**Source: B1H0531-02**					
Zinc	0.212	0.0100	mg/l	0.200	0.0171	97.4	75-125			
Matrix Spike Dup (1I04034-MSD1)					**Source: B1H0531-02**					
Zinc	0.213	0.0100	mg/l	0.200	0.0171	98.0	75-125	0.471	20	

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1H24022: Prepared 08/24/01 Using General Preparation										
Blank (1H24022-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (1H24022-DUP1)					**Source: B1H0505-01**					
Total Suspended Solids	16	4.0	mg/l		17			6.1	19	
Batch 1H24046: Prepared 08/23/01 Using General Preparation										
Duplicate (1H24046-DUP1)					**Source: B1H0531-02**					
pH	6.88		pH Units		6.87			0.145	10	
Batch 1H25006: Prepared 08/24/01 Using General Preparation										
Blank (1H25006-BLK1)										
Turbidity	ND	1.00	NTU							
S (1H25006-BS1)										
Turbidity	19.0	1.00	NTU	20.0		95.0	90-110			
LCS Dup (1H25006-BSD1)										
Turbidity	19.0	1.00	NTU	20.0		95.0	90-110	0.00	20	
Duplicate (1H25006-DUP1)					**Source: B1H0029-07**					
Turbidity	ND	1.00	NTU		ND			34.5	20	
Batch 1H25010: Prepared 08/23/01 Using General Preparation										
Blank (1H25010-BLK1)										
Orthophosphate-phosphorus	ND	0.00200	mg/l							

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1H25010: Prepared 08/23/01 Using General Preparation										
LCS (1H25010-BS1)										
Orthophosphate-phosphorus	0.0516	0.00200	mg/l	0.0500		103	90-110			
LCS Dup (1H25010-BSD1)										
Orthophosphate-phosphorus	0.0522	0.00200	mg/l	0.0500		104	90-110	1.16	20	
Duplicate (1H25010-DUP1)					**Source: B1H0529-02**					
Orthophosphate-phosphorus	0.0370	0.00200	mg/l		0.0397			7.04	25	
Matrix Spike (1H25010-MS1)					**Source: B1H0529-02**					
Orthophosphate-phosphorus	0.0876	0.00200	mg/l	0.0500	0.0397	95.8	80-120			
Batch 1H29021: Prepared 08/29/01 Using EPA 3010A										
Blank (1H29021-BLK1)										
Hardness	ND	1.00mg eq. CaCO3/L								
LCS (1H29021-BS1)										
Hardness	70.3	1.00mg eq. CaCO3/L					70-130			
LCS Dup (1H29021-BSD1)										
Hardness	70.4	1.00mg eq. CaCO3/L					70-130	0.142	20	
Matrix Spike (1H29021-MS1)					**Source: B1H0499-03**					
Hardness	791	1.00mg eq. CaCO3/L		737			75-125			
Matrix Spike Dup (1H29021-MSD1)					**Source: B1H0499-03**					
Hardness	791	1.00mg eq. CaCO3/L		737			75-125	0.00	20	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Amar Gill, Project Manager

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1I05027: Prepared 09/04/01 Using General Preparation										
Blank (1I05027-BLK1)										
Phosphorus	ND	0.00500	mg/l							
LCS (1I05027-BS1)										
Phosphorus	0.0532	0.00500	mg/l	0.0500		106	90-120			
LCS Dup (1I05027-BSD1)										
Phosphorus	0.0549	0.00500	mg/l	0.0500		110	90-120	3.15	20	
Matrix Spike (1I05027-MS1)					**Source: B1H0566-01**					
Phosphorus	0.0914	0.00500	mg/l	0.0500	0.0399	103	60-139			
Matrix Spike Dup (1I05027-MSD1)					**Source: B1H0566-01**					
Phosphorus	0.0934	0.00500	mg/l	0.0500	0.0399	107	60-139	2.16	25	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	09/06/01 17:06

Notes and Definitions

Q-30	This sample was laboratory filtered since it was not field filtered as is required by the methodology.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Amar Gill, Project Manager

CHAIN OF CUSTODY RECORD

Sample Collection by: TAYLOR ASSOCIATES
Contact: ~~Ingrid Wertz~~
Tel: ~~206.633.4486~~ James Packman 206/781-1487
Laboratory: North Creek Analytical
Contact: Amar Gill
Tel: 425.420.9232

Client: WSDOT
Contact: Naomi Chechowitz
Tel: 206.440.4602

or

University of Washington
Contact: David Stensel
Tel: 206.543.9358

Page: 1 of 1
Project ID: Vortechs SR405
Case File #:
Date recorded by:

STANDARD TURN AROUND

SR405 Vortechs™ Monitoring Project

Sample ID	Date Collected	Time Collected*	Comp?	Grab?	# of contain.	matrix	Analysis Required: TSS	Turbidity	Hardness	Total Zn	Dissolved Zn	TP	Ortho-P	PSD	Other?	Other?	Notes
VOR-082201-IN-PSD	8/22/01	17:25	Y	N	1	W								✓			
VOR-082201-OUT-PSD	8/22/01	17:24	Y	N	1	W								✓			

Comments/Special Notes:

* Time collected is time of last aliquot of composite.

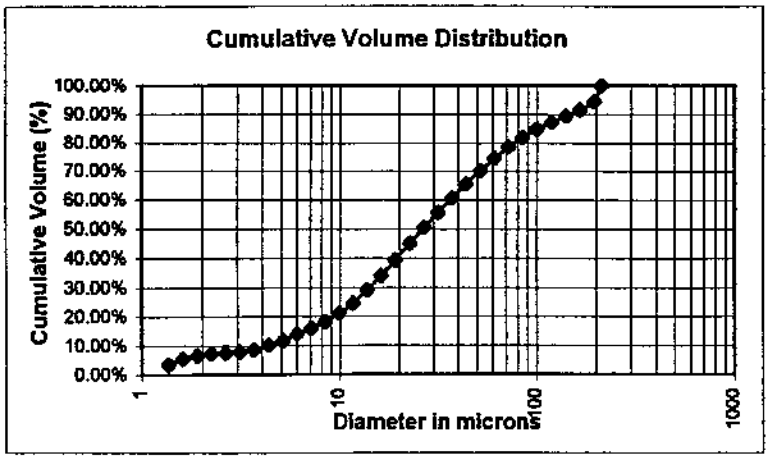
Relinquished by:		Relinquished by:
Signature		Signature
Printed Name	James Packman	Printed Name
Company	Taylor Associates	Company
Date/Time	8/23/01 14:20	Date/Time
Received by:	H Daurd Stensel	Received by:
Signature		Signature
Printed Name	H Dan Stensel	Printed Name
Company	Univ of WA	Company
Date/Time	8-23-01 2:20 pm	Date/Time

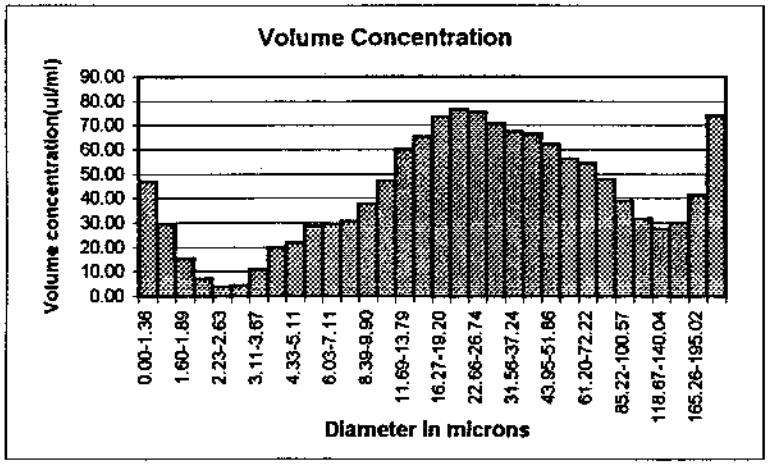
Particle Size Distribution Analysis Results: Storm 5 Inlet

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	SR405-Vortechs	
Sample ID:	VOR-101101-IN	
Date and Time Collected:	10/11/01	0:42
Date and Time of PSD Analysis:	10/12/01	14:58





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	47.08	3.48%	24.94
1.36-1.60	29.60	5.67%	15.68
1.60-1.89	15.36	6.80%	8.14
1.89-2.23	7.08	7.33%	3.75
2.23-2.63	3.98	7.62%	2.11
2.63-3.11	4.65	7.97%	2.46
3.11-3.67	10.84	8.77%	5.74
3.67-4.33	19.79	10.23%	10.48
4.33-5.11	21.70	11.84%	11.50
5.11-6.03	28.64	13.95%	15.17
6.03-7.11	29.55	16.14%	15.66
7.11-8.39	30.45	18.39%	16.13
8.39-9.90	37.59	21.17%	19.92
9.90-11.69	47.25	24.66%	25.03
11.69-13.79	59.87	29.09%	31.72
13.79-16.27	65.18	33.91%	34.53
16.27-19.20	73.52	39.34%	38.95
19.20-22.66	76.39	44.99%	40.47
22.66-26.74	75.37	50.56%	39.94
26.74-31.56	70.65	55.79%	37.43
31.56-37.24	67.34	60.77%	35.68
37.24-43.95	66.54	65.69%	35.25
43.95-51.86	62.16	70.28%	32.94
51.86-61.20	56.35	74.45%	29.85
61.20-72.22	54.52	78.48%	28.89
72.22-85.22	47.80	82.01%	25.33
85.22-100.57	38.79	84.88%	20.55
100.57-118.67	31.57	87.22%	16.73
118.67-140.04	27.59	89.25%	14.62
140.04-165.26	30.04	91.48%	15.91
165.26-195.02	41.28	94.53%	21.87
195.02-212	74.01	100.00%	39.21
Total	1352.52		716.60

Computed Statistics *:

Weight Mean =	53.92	microns
D_{10} =	3.67	microns
D_{50} =	22.66	microns
D_{90} =	140.04	microns

Volume of Sample:	1000	ml
Volume of Dilution:	10400	ml added
Comments:	1/0/00	

Size Range (microns)	Mass of TSS (mg)	% Mass TSS
< 212	716.60	93.69%
212-425	19.70	2.58%
425-850	10.20	1.33%
>850	18.40	2.41%
Total	764.90	100.00%

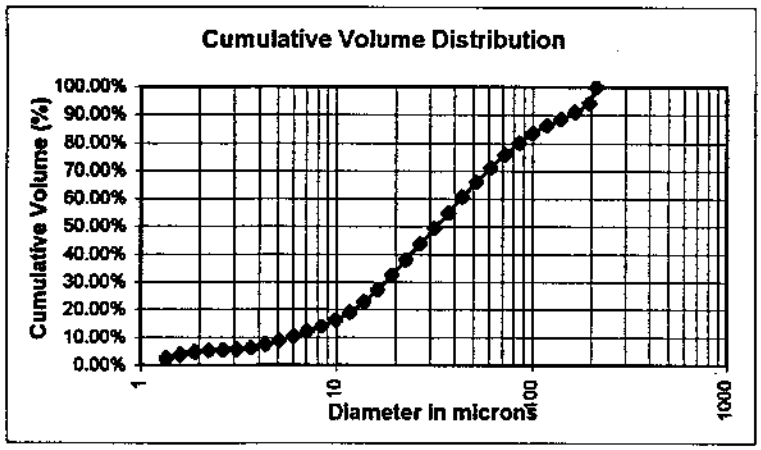
* *Statistics as well as graphical output include only particles < 212 micrometers.*

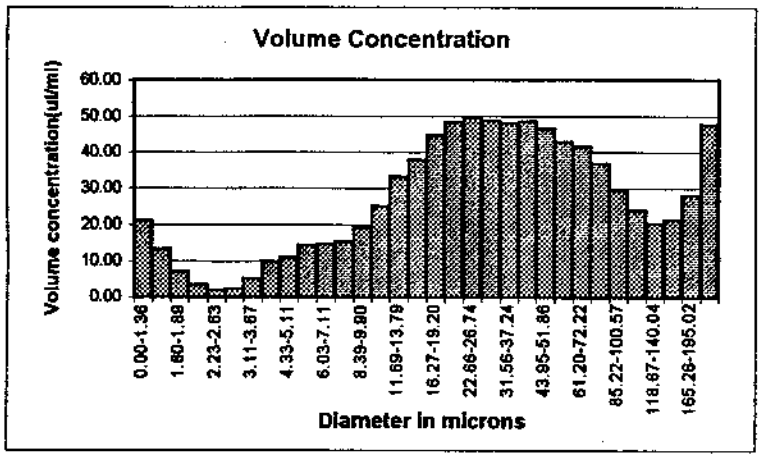
Particle Size Distribution Analysis Results: Storm 5 Outlet

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	SR405-Vortechs	
Sample ID:	VOR-101101-OUT	
Date and Time Collected:	10/11/01	0:43
Date and Time of PSD Analysis:	10/12/01	16:57





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	21.12	2.45%	11.39
1.36-1.60	13.47	4.01%	7.27
1.60-1.89	7.12	4.83%	3.84
1.89-2.23	3.34	5.22%	1.80
2.23-2.63	1.91	5.44%	1.03
2.63-3.11	2.24	5.70%	1.21
3.11-3.67	5.26	6.31%	2.84
3.67-4.33	9.87	7.46%	5.33
4.33-5.11	11.13	8.75%	6.01
5.11-6.03	14.44	10.42%	7.79
6.03-7.11	14.75	12.13%	7.96
7.11-8.39	15.36	13.91%	8.29
8.39-9.90	19.22	16.14%	10.37
9.90-11.69	25.00	19.04%	13.49
11.69-13.79	33.17	22.88%	17.90
13.79-16.27	37.92	27.28%	20.46
16.27-19.20	44.72	32.46%	24.13
19.20-22.66	48.45	38.08%	26.14
22.66-26.74	49.90	43.87%	26.92
26.74-31.56	48.76	49.52%	26.31
31.56-37.24	47.98	55.08%	25.89
37.24-43.95	48.59	60.71%	26.22
43.95-51.86	46.56	66.11%	25.12
51.86-61.20	42.87	71.08%	23.13
61.20-72.22	41.64	75.91%	22.46
72.22-85.22	36.73	80.17%	19.82
85.22-100.57	29.68	83.61%	16.01
100.57-118.67	23.88	86.36%	12.88
118.67-140.04	20.36	88.74%	10.99
140.04-165.26	21.42	91.22%	11.56
165.26-195.02	28.00	94.47%	15.11
195.02-212	47.74	100.00%	25.76
Total	862.58		465.40

Computed Statistics *:

Weight Mean =	58.74	microns
D_{10} =	5.11	microns
D_{50} =	31.56	microns
D_{90} =	140.04	microns

Volume of Sample:	950	ml
Volume of Dilution:	5600	ml added
Comments:	1/0/00	

Size Range (microns)	Mass of TSS (mg)	% Mass of TSS
< 212	465.40	92.58%
212-425	16.60	3.30%
425-850	12.80	2.55%
>850	7.90	1.57%
Total	502.70	100.00%

* *Statistics as well as graphical output include only particles < 212 micrometers. The rest were manually sieved and included only for calculating TSS and VSS*

SITE VISIT SHEET (SR 405 Vortechs^{TM} Monitoring)

Date/Time 8/20/01 high noon Field Staff JA/TW Weather ptly cloudy (~ 22°C)

(Pre-Strom Visit) or Post-Storm Visit (circle one)

INLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? 12:50 Y

Time downloaded n/a

level 0.01- 0.026

OUTLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? 12:28, Y

Level (ft.) 0.013

Velocity (f/s) 0.22

Flow (cfs) 0 -

Total Flow (cf) 11,500

Sig/Spec str. C ? ?

Time downloaded n/a

Pre - Storm Visit

INLET

Battery (V)	12.3
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y, N
Sampler tubing ok (Y/N)?	Y
~~Strainer ok?~~	
Ext. desiccant ok (Y/N)? Changed?	N Y
Int. desiccant ok (Y/N)? Changed?	Y, N
Measure Dn level? Ok?	
Sample Volume (ml)	200 ml
Inspect Rain Gage	Y
Sampler enabled	Y

OUTLET

Battery (V)	12.6
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y, N
Sampler tubing ok (Y/N)?	Y
~~Strainer ok?~~	
Ext. desiccant ok (Y/N)? Changed?	N, Y
Int. desiccant ok (Y/N)? Changed?	Y
Measure Dn level? Ok?	
Enable level (ft)	20.5 ft
Pacing (cf) / Sample Volume (ml)	600 cf/200 ml
Sample Enabled?	Y

Post - Storm Visit

INLET

Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	8/20/01 11:50
Composite Began (date/time)?	8/21 09:26
Number of subsamples taken?	50 (51?)
Any subsample collection errors?	no
Last Sample (date/time)?	8/22 17:25
Est. Sample Volume Collected (ml)	10.5 L
Sample ID?	VOR-082201-IN

OUTLET

Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	8/21 09:25
Composite Began (date/time)?	8/21 09:25
Number of subsamples taken?	50
Any subsample collection errors?	no
Last Sample (date/time)?	8/22 ?:24
Est. Sample Volume Collected (ml)	10.5 L
Sample ID?	VOR-082201-OUT

See next page

Y/N	Value	Storm Validation Criteria
	hrs. (if known)	Was there an antecedent dry period of at least six hours?
	in.	Was total rainfall greater than or equal to 0.25"?
	hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
Y	84% hyrograph/rainfall % (approx.)	Was greater than 75% of the total volume of the storm sampled?
	# subsample	Were at least 10 sub-samples collected at the inlet?
	# subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. N/A Field blank collected? If so, Sample ID. ______

NOTES (including any problems with equipment or maintenance activities performed):

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 8/23/01 11:15 Field Staff JP Weather Scattered Showers ~20°C)

Pre-Strom Visit - or Post-Storm Visit (circle one)

INLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? _____

Time downloaded 11:40 DST

level = 0.023 ft

OUTLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? _____

Level (ft.) 0.316 ft

Velocity (f/s) 0.45

Flow (cfs) 0

Total Flow (cf) 41193.3

Sig/Spec str. 0 / 0

Time downloaded 11:35 DST

Pre - Storm Visit

INLET

Battery (V)	_____
Clean bottle (Y/N)?	_____
Pump tubing ok (Y/N)? Replaced?	_____
Sampler tubing ok (Y/N)?	_____
Strainer ok?	_____
Ext. desiccant ok (Y/N)? Changed?	_____
Int. desiccant ok (Y/N)? Changed?	_____
Measure Dn level? Ok?	_____
Sample Volume (ml)	_____
Inspect Rain Gage	_____
Sampler enabled	_____

OUTLET

Battery (V)	_____
Clean bottle (Y/N)?	_____
Pump tubing ok (Y/N)? Replaced?	_____
Sampler tubing ok (Y/N)?	_____
Strainer ok?	_____
Ext. desiccant ok (Y/N)? Changed?	_____
Int. desiccant ok (Y/N)? Changed?	_____
Measure Dn level? Ok?	_____
Enable level (ft)	_____
Pacing (cf) / Sample Volume (ml)	_____
Sample Enabled?	_____

Post - Storm Visit

INLET

Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	8/21 09:26
Composite Began (date/time)?	8/21 09:26
Number of subsamples taken?	50
Any subsample collection errors?	no
Last Sample (date/time)?	8/22 17:25
Est. Sample Volume Collected (ml)	10.5 L
Sample ID?	VDR-082201-IN

OUTLET

Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	8/21 09:25
Composite Began (date/time)?	8/21 09:25
Number of subsamples taken?	50
Any subsample collection errors?	no
Last Sample (date/time)?	8/22 17:24
Est. Sample Volume Collected (ml)	10.5 L
Sample ID?	VDR-082201-OUT

Y/N	Value	Storm Validation Criteria
Y	hrs. (if known)	Was there an antecedent dry period of at least six hours?
Y	1.73" in.	Was total rainfall greater than or equal to 0.25"? 1.47"
Y	~36 hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
Y	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
Y	50 # subsample	Were at least 10 sub-samples collected at the inlet?
Y	50 # subsample	Were at least 10 sub-samples collected at the outlet?

84½ by rainfall

Was a field duplicate collected? If so, Sample ID. N/a Field blank collected? If so, Sample ID. _____

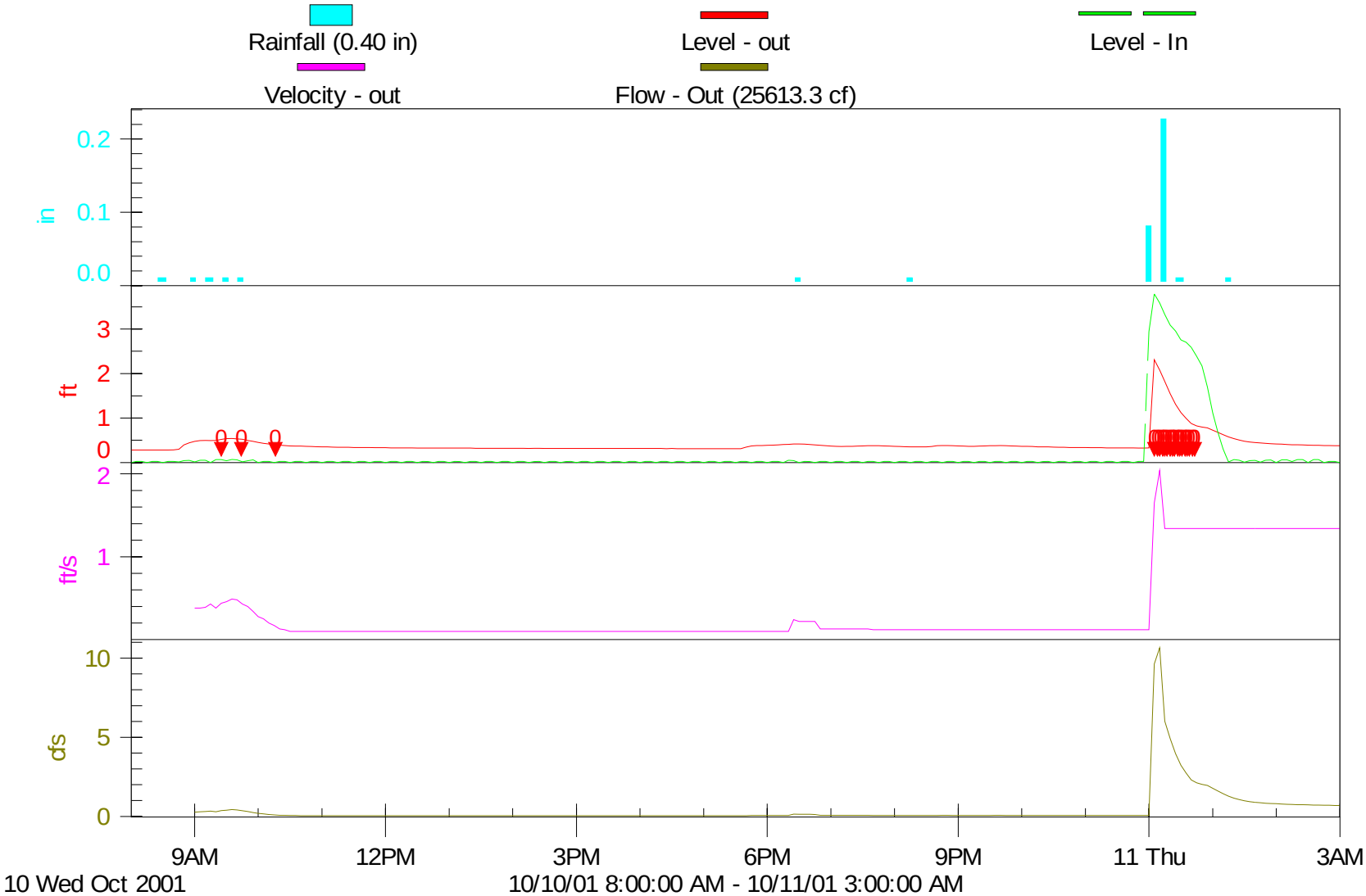
NOTES (including any problems with equipment or maintenance activities performed):

STORM EVENT

NUMBER 5

SR 405 Vortechnics

Storm #5, 10-11 October 2001



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PROJECT NARRATIVE for B1J0327

Client: Taylor Associates
Project Manager: James Packman
Project Name: SR405 Vortechs
Project Number: Not Provided

1.0 DESCRIPTION OF CASE

Two water sample were received for the analysis of:

- Total Zinc by EPA 200.8
- Dissolved Zinc by EPA 200.8
- Hardness by SM2340B
- Orthophosphate by EPA 365.2
- Total Phosphorous by EPA 365.2
- Total Suspended Solids by EPA 160.2
- Turbidity
- pH by EPA 150.1

2.0 COMMENTS ON SAMPLE RECEIPT

The samples were received and logged in on 11th October 2001 at a temperature of 5.5C.

Preparation and Analysis

There were no anomalies associated with the preparation and analysis with all QA being within method established criteria. However the following analyses do need to be commented on

Dissolved Zinc

The dissolved metals were filtered and preserved with Nitric Acid in house prior to analysis.

Orthophosphate

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PROJECT NARRATIVE for B1J0327

The analytical batch percent recoveries for the Matrix Spike and Matrix Spike Duplicate were outside the method established control limits, since the remaing batch QC was within control this is not thought to be an issue

"I certify that this data package is in compliance with the Contract both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."

Amar Gill
Project Manager
North Creek Analytical

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VOR-101101-IN	B1J0327-01	Water	10/11/01 00:42	10/11/01 11:00
VOR-101101-OUT	B1J0327-02	Water	10/11/01 00:43	10/11/01 11:00

Amar Gill, Project Manager

www.ncalabs.com

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Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Total Metals by EPA 200 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-101101-IN (B1J0327-01) Water	**Sampled: 10/11/01 00:42**		**Received: 10/11/01 11:00**						
Zinc	**0.135**	0.0100	mg/l	1	1J22029	10/22/01	10/23/01	EPA 200.8	
VOR-101101-OUT (B1J0327-02) Water	**Sampled: 10/11/01 00:43**		**Received: 10/11/01 11:00**						
Zinc	**0.136**	0.0100	mg/l	1	1J22029	10/22/01	10/23/01	EPA 200.8	

North Creek Analytical - Bothell

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Amar Gill, Project Manager

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Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Dissolved Metals by EPA 200 Series Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
/OR-101101-IN (B1J0327-01) Water	**Sampled: 10/11/01 00:42**		**Received: 10/11/01 11:00**						
Zinc	ND	0.0100	mg/l	1	1J16018	10/16/01	10/19/01	EPA 200.8	Q-30
'OR-101101-OUT (B1J0327-02) Water	**Sampled: 10/11/01 00:43**		**Received: 10/11/01 11:00**						
Zinc	**0.0140**	0.0100	mg/l	1	1J16018	10/16/01	10/19/01	EPA 200.8	Q-30

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
VOR-101101-IN (B1J0327-01) Water	**Sampled: 10/11/01 00:42 Received: 10/11/01 11:00**								
Hardness	**64.3**	2.00	mg eq. CaCO3/L	2	1J22023	10/22/01	10/23/01	SM 2340B	
Orthophosphate-phosphorus	**0.0264**	0.00200	mg/l	1	1J11034	10/11/01	10/11/01	EPA 365.2	
Phosphorus	**0.922**	0.0200	"	4	1J18027	10/17/01	10/18/01	"	
pH	**7.00**		pH Units	1	1J11035	10/11/01	10/11/01	EPA 150.1	
Total Suspended Solids	**580**	4.0	mg/l	"	1J12005	10/12/01	10/15/01	EPA 160.2	
Turbidity	**285**	10.0	NTU	10	1J11051	10/11/01	10/11/01	EPA 180.1	
VOR-101101-OUT (B1J0327-02) Water	**Sampled: 10/11/01 00:43 Received: 10/11/01 11:00**								
Hardness	**52.2**	2.00	mg eq. CaCO3/L	2	1J22023	10/22/01	10/23/01	SM 2340B	
Orthophosphate-phosphorus	**0.0109**	0.00200	mg/l	1	1J11034	10/11/01	10/11/01	EPA 365.2	
Phosphorus	**0.764**	0.0200	"	4	1J18027	10/17/01	10/18/01	"	
pH	**6.75**		pH Units	1	1J11035	10/11/01	10/11/01	EPA 150.1	
Total Suspended Solids	**440**	4.0	mg/l	"	1J12005	10/12/01	10/15/01	EPA 160.2	
Turbidity	**154**	10.0	NTU	10	1J11051	10/11/01	10/11/01	EPA 180.1	

North Creek Analytical - Bothell

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Total Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1J22029: Prepared 10/22/01 Using EPA 200 Series										
Blank (1J22029-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1J22029-BS1)										
Zinc	0.202	0.0100	mg/l	0.200		101	85-115			
LCS Dup (1J22029-BSD1)										
Zinc	0.199	0.0100	mg/l	0.200		99.5	85-115	1.50	15	
Duplicate (1J22029-DUP1)					**Source: B1J0332-01**					
Zinc	0.150	0.0100	mg/l		0.153			1.98	20	
Duplicate (1J22029-DUP2)					**Source: B1J0327-01**					
Zinc	0.143	0.0100	mg/l		0.135			5.76	20	
Matrix Spike (1J22029-MS1)					**Source: B1J0332-01**					
	0.363	0.0100	mg/l	0.200	0.153	105	75-125			

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Dissolved Metals by EPA 200 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1J16018: Prepared 10/16/01 Using EPA 3005A										
Blank (1J16018-BLK1)										
Zinc	ND	0.0100	mg/l							
LCS (1J16018-BS1)										
Zinc	0.215	0.0100	mg/l	0.200		108	85-115			
LCS Dup (1J16018-BSD1)										
Zinc	0.212	0.0100	mg/l	0.200		106	85-115	1.41	15	
Duplicate (1J16018-DUP1)					**Source: B1J0327-01**					
Zinc	ND	0.0100	mg/l		ND			2.66	20	
Matrix Spike (1J16018-MS1)					**Source: B1J0189-01**					
Zinc	0.223	0.0100	mg/l	0.200	ND	109	75-125			
Matrix Spike Dup (1J16018-MSD1)					**Source: B1J0189-01**					
:	0.221	0.0100	mg/l	0.200	ND	108	75-125	0.901	20	

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1J11034: Prepared 10/11/01 Using General Preparation										
Blank (1J11034-BLK1)										
Orthophosphate-phosphorus	ND	0.00200	mg/l							
LCS (1J11034-BS1)										
Orthophosphate-phosphorus	0.0498	0.00200	mg/l	0.0500		99.6	90-110			
LCS Dup (1J11034-BSD1)										
Orthophosphate-phosphorus	0.0495	0.00200	mg/l	0.0500		99.0	90-110	0.604	20	
Matrix Spike (1J11034-MS1)					**Source: B1J0324-01**					
Orthophosphate-phosphorus	0.135	0.00200	mg/l	0.0500	0.114	42.0	80-120			Q-01
Matrix Spike Dup (1J11034-MSD1)					**Source: B1J0324-01**					
Orthophosphate-phosphorus	0.134	0.00200	mg/l	0.0500	0.114	40.0	80-120	0.743	25	Q-01
Batch 1J11035: Prepared 10/11/01 Using General Preparation										
plicate (1J11035-DUP1)					**Source: B1J0324-01**					
pH	7.92		pH Units		7.93			0.126	10	
Batch 1J11051: Prepared 10/11/01 Using General Preparation										
Blank (1J11051-BLK1)										
Turbidity	ND	1.00	NTU							
LCS (1J11051-BS1)										
Turbidity	19.1	1.00	NTU	20.0		95.5	90-110			

North Creek Analytical - Bothell

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aylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1J11051: Prepared 10/11/01 Using General Preparation										
LCS Dup (1J11051-BSD1)										
Turbidity	18.8	1.00	NTU	20.0		94.0	90-110	1.58	20	
Duplicate (1J11051-DUP1)					**Source: B1J0327-01**					
Turbidity	281	10.0	NTU		285			1.41	20	
Batch 1J12005: Prepared 10/12/01 Using General Preparation										
Blank (1J12005-BLK1)										
Total Suspended Solids	ND	4.0	mg/l							
Duplicate (1J12005-DUP1)					**Source: B1J0340-01**					
Total Suspended Solids	590	4.0	mg/l		600			1.7	19	
Batch 1J18027: Prepared 10/17/01 Using General Preparation										
nk (1J18027-BLK1)										
sphorus	ND	0.00500	mg/l							
LCS (1J18027-BS1)										
Phosphorus	0.0459	0.00500	mg/l	0.0500		91.8	90-120			
LCS Dup (1J18027-BSD1)										
Phosphorus	0.0456	0.00500	mg/l	0.0500		91.2	90-120	0.656	20	
Matrix Spike (1J18027-MS1)					**Source: B1J0442-04**					
Phosphorus	0.198	0.00500	mg/l	0.0500	0.195	6.00	60-139			Q-13

North Creek Analytical - Bothell

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Taylor Associates	Project: SR405 Vortechs	
3917 Ashworth Ave North	Project Number: Not Provided	**Reported:**
Seattle WA/USA, 98103	Project Manager: James Packman	10/24/01 16:22

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1J18027: Prepared 10/17/01 Using General Preparation										
Matrix Spike Dup (1J18027-MSD1)					**Source: B1J0442-04**					
Phosphorus	0.205	0.00500	mg/l	0.0500	0.195	20.0	60-139	3.47	25	Q-13
Batch 1J22023: Prepared 10/22/01 Using EPA 200 Series										
Blank (1J22023-BLK1)										
Hardness	ND	1.00	mg eq. CaCO3/L							
LCS (1J22023-BS1)										
Hardness	35.5	1.00	mg eq. CaCO3/L	33.1		107	70-130			
LCS Dup (1J22023-BSD1)										
Hardness	36.9	1.00	mg eq. CaCO3/L	33.1		111	70-130	3.87	20	
Duplicate (1J22023-DUP1)					**Source: B1J0327-01**					
Hardness	56.9	1.00	mg eq. CaCO3/L		64.3			12.2	20	
Matrix Spike (1J22023-MS1)					**Source: B1J0324-01**					
Hardness	97.4	10.0	mg eq. CaCO3/L	33.1	60.6	111	75-125			

North Creek Analytical - Bothell

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Amar Gill, Project Manager

CHAIN OF CUSTODY RECORD

Sample Collection by: TAYLOR ASSOCIATES
Contact: James Packman
Tel: 206.781.1487

Client: WSDOT
Contact: Jay Cammermeyer
Tel: 206.440.5070

Page: 1 of 1
Project ID: SR 405 - Vortechnics
Case File #:
Date recorded by:

Laboratory: North Creek Analytical
Contact: Amar Gill
Tel: 425.420.9232

or

University of Washington
Contact: David Stensel
Tel: 206.543.9358

Standard Turnaround

SR405 Vortechs™ Monitoring Project

Sample ID	Date Collected	Time Collected*	Comp?	Grab?	# of contain.	matrix	Analysis Required: TSS	Turbidity	Hardness	Total Zn	Dissolved Zn	TP	Ortho-P	PSD	Other? pH	Other?	Notes
VOR-101101-IN	10/11/01	00:42	Y	✓	3	W	✓	✓	✓	✓	✓	✓	✓		✓		
VOR-101101-OUT	10/11/01	00:43	Y	✓	3	W	✓	✓	✓	✓	✓	✓	✓		✓		

Comments/Special Notes:
*Time of last effluent

Relinquished by:	James Packman	Relinquished by:
Signature		Signature
Printed Name		Printed Name
Company	Taylor Associates	Company
Date/Time	10/11/01 11:00	Date/Time
Received by:		Received by:
Signature		Signature
Printed Name	PRAMA TONTZ	Printed Name
Company	NCA	Company
Date/Time	10/11/01 11:00	Date/Time

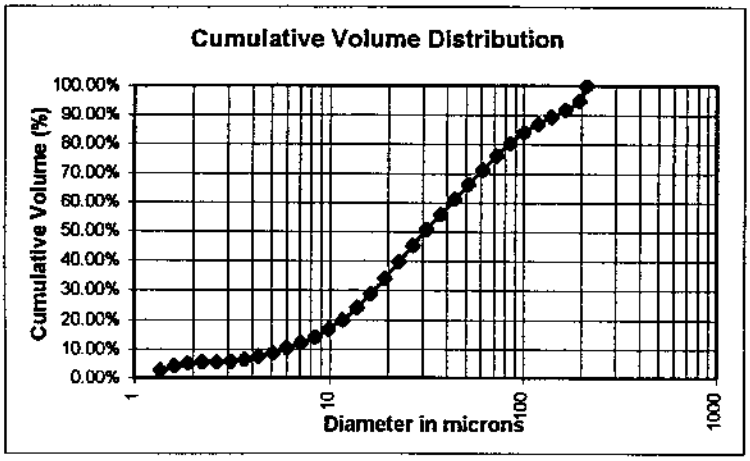
5.5° W/D

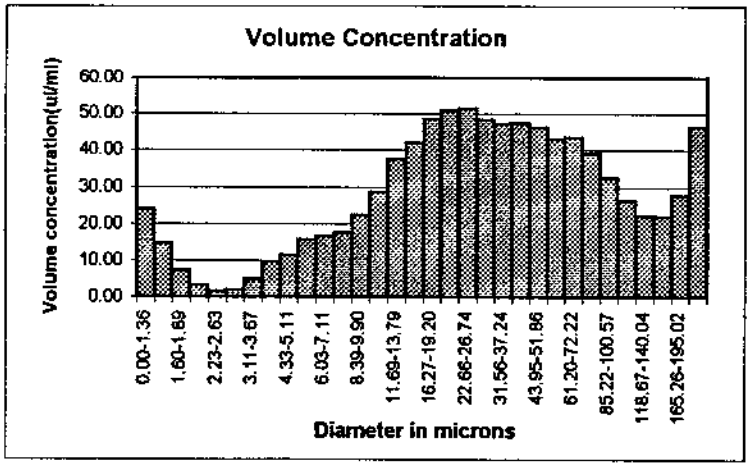
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	Vortechs SR 405	
Sample ID:	VOR-082201-IN	
Date and Time Collected:	8/22/01	0.725694444
Date and Time of PSD Analysis:	8/24/01	0.694444444





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	24.06	2.67%	11.41
1.36-1.60	14.64	4.29%	6.94
1.60-1.89	7.25	5.09%	3.44
1.89-2.23	3.15	5.44%	1.49
2.23-2.63	1.67	5.62%	0.79
2.63-3.11	1.93	5.84%	0.92
3.11-3.67	4.82	6.37%	2.28
3.67-4.33	9.69	7.44%	4.59
4.33-5.11	11.43	8.71%	5.42
5.11-6.03	15.61	10.44%	7.40
6.03-7.11	16.60	12.28%	7.87
7.11-8.39	17.71	14.24%	8.39
8.39-9.90	22.39	16.72%	10.61
9.90-11.69	28.58	19.89%	13.55
11.69-13.79	37.63	24.05%	17.83
13.79-16.27	41.94	28.70%	19.88
16.27-19.20	48.67	34.09%	23.07
19.20-22.66	50.88	39.73%	24.12
22.66-26.74	51.45	45.42%	24.38
26.74-31.56	48.50	50.80%	22.99
31.56-37.24	47.32	56.04%	22.43
37.24-43.95	47.46	61.29%	22.49
43.95-51.86	46.25	66.42%	21.92
51.86-61.20	43.09	71.19%	20.42
61.20-72.22	43.57	76.01%	20.65
72.22-85.22	39.16	80.35%	18.56
85.22-100.57	32.60	83.96%	15.45
100.57-118.67	26.30	86.88%	12.46
118.67-140.04	22.20	89.33%	10.52
140.04-165.26	22.06	91.78%	10.45
165.26-195.02	27.69	94.85%	13.12
195.02-212	46.54	100.00%	22.06
Total	902.82		427.90

Computed Statistics:

Weight Mean =	57.54	microns
D_{10} =	5.11	microns
D_{50} =	26.74	microns
D_{90} =	140.04	microns

Volume of Sample:	975 ml
Volume of Dilution:	5000 ml added

Size Range (microns)	Mass of TSS (mg)	% Mass TSS	Mass of VSS (mg)	% Mass VSS
<212	427.90	96.55%	18402.50	0.00%
212-425	5.90	1.33%	1387.50	0.00%
425-850	4.40	0.99%	1382.00	0.00%
>850	5.00	1.13%	1390.40	0.00%
Total	443.20	100.00%	22562.40	0.00%

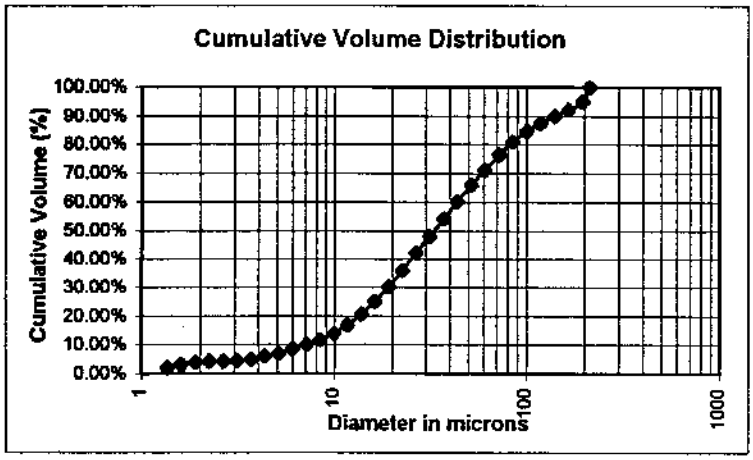
Comments: Graphs and D-values are calculated from values given by PSA unit so these do not reflect particles greater than 212 microns, which were manually sieved out.

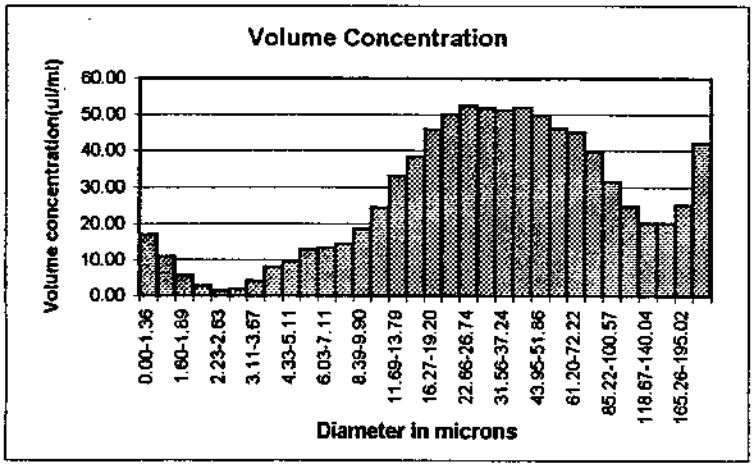
Particle Size Distribution Analysis Results

Report Prepared for:
Ingrid Weltz
Taylor Associates
Tel: 206.633.4486

Analysis Performed by:
Lynel Rabago
University of Washington
Department of Civil Engineering
Contact: Dr. David Stensel
Tel: 206.543.9358

Project ID:	Vortechs SR405	
Sample ID:	VOR-082201-OUT	
Date and Time Collected:	8/22/01	0.725
Date and Time of PSD Analysis:	8/24/01	0.772222222





Size Range (microns)	Volume Concentration (ul / l)	Cumulative Volume (%)	Mass (mg)
0.00-1.36	16.97	1.96%	7.73
1.36-1.60	10.81	3.22%	4.93
1.60-1.89	5.69	3.87%	2.59
1.89-2.23	2.65	4.18%	1.21
2.23-2.63	1.49	4.35%	0.68
2.63-3.11	1.73	4.55%	0.79
3.11-3.67	4.08	5.03%	1.86
3.67-4.33	7.96	5.95%	3.63
4.33-5.11	9.49	7.05%	4.33
5.11-6.03	12.74	8.52%	5.81
6.03-7.11	13.39	10.07%	6.10
7.11-8.39	14.41	11.74%	6.57
8.39-9.90	18.53	13.89%	8.45
9.90-11.69	24.44	16.71%	11.14
11.69-13.79	33.00	20.53%	15.04
13.79-16.27	38.34	24.97%	17.48
16.27-19.20	45.92	30.29%	20.93
19.20-22.66	50.18	36.10%	22.87
22.66-26.74	52.54	42.18%	23.95
26.74-31.56	51.74	48.17%	23.59
31.56-37.24	51.22	54.10%	23.35
37.24-43.95	51.93	60.12%	23.67
43.95-51.86	49.82	65.88%	22.71
51.86-61.20	46.12	71.22%	21.02
61.20-72.22	45.10	76.45%	20.56
72.22-85.22	39.66	81.04%	18.08
85.22-100.57	31.50	84.68%	14.36
100.57-118.67	24.71	87.54%	11.26
118.67-140.04	20.21	89.88%	9.21
140.04-165.26	20.20	92.22%	9.21
165.26-195.02	25.16	95.14%	11.47
195.02-212	42.01	100.00%	19.15
Total	863.74		393.70

Computed Statistics:

Weight Mean =	58.05 microns
D_{10} =	6.03 microns
D_{50} =	31.56 microns
D_{90} =	140.04 microns

Size Range (microns)	Mass of TSS (mg)	% Mass TSS	Mass of VSS (mg)	% Mass VSS
< 212	393.70	97.57%	18371.00	0.00%
212-425	5.60	1.39%	1382.80	0.00%
425-850	2.30	0.57%	1375.40	0.00%
>850	1.90	0.47%	1372.70	0.00%
Total	403.50	100.00%	22501.90	0.00%

Volume of Sample: 900 ml
Volume of Dilution: 5000 ml added
Comments: VSS analysis was not performed.

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 10/9/01 13:37 (PDT) Field Staff JW (visit by J.C.) Weather sunny ~50°

Pre-Strom Visit (circled) - or - Post-Storm Visit (circle one)

INLET

Check Current Readings / Download:

ISCO Time? reset (Y/N)? 13:49 (PST) ✓

Time downloaded ——

OUTLET

Check Current Readings / Download:

ISCO	
Time? reset (Y/N)?	13:48 (PST) ✓
Level (ft.)	0.302
Velocity (f/s)	*0.11*
Flow (cfs)	0
Total Flow (cf)	7807.2
Sig/Spec str.	0/0
Time downloaded	——

Pre - Storm Visit

INLET

Battery (V)	12.3
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y *
Sampler tubing ok (Y/N)?	Y
Strainer ok?	
Ext. desiccant ok (Y/N)? Changed?	Y/N
Int. desiccant ok (Y/N)? Changed?	Y/N
Measure Dn level? Ok?	empty - ok
Sample Volume (ml)	200 ml
Inspect Rain Gage	ok
Sampler enabled	Y

OUTLET

Battery (V)	12.3
Clean bottle (Y/N)?	Y
Pump tubing ok (Y/N)? Replaced?	Y
Sampler tubing ok (Y/N)?	Y
Strainer ok?	—
Ext. desiccant ok (Y/N)? Changed?	Y/N
Int. desiccant ok (Y/N)? Changed?	Y/N
Measure Dn level? Ok?	no measurement, but realistic low level
Enable level (ft)	0.15'
Pacing (cf) / Sample Volume (ml)	450 cf / 200 ml
Sample Enabled?	Y

Post - Storm Visit

INLET

Equipment Ran Completely?	
Sampler Enabled (date/time)?	
Composite Began (date/time)?	
Number of subsamples taken?	
Any subsample collection errors?	
Last Sample (date/time)?	
Est. Sample Volume Collected (ml)	
Sample ID?	

OUTLET

Equipment Ran Completely?	
Sampler Enabled (date/time)?	
Composite Began (date/time)?	
Number of subsamples taken?	
Any subsample collection errors?	
Last Sample (date/time)?	
Est. Sample Volume Collected (ml)	
Sample ID?	

Y/N	Value	Storm Validation Criteria
	hrs. (if known)	Was there an antecedent dry period of at least six hours?
	in.	Was total rainfall greater than or equal to 0.25"?
	hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
	% (approx.)	Was greater than 75% of the total volume of the storm sampled?
	# subsample	Were at least 10 sub-samples collected at the inlet?
	# subsample	Were at least 10 sub-samples collected at the outlet?

Was a field duplicate collected? If so, Sample ID. ______ Field blank collected? If so, Sample ID. ______

NOTES (including any problems with equipment or maintenance activities performed):

* checked calibration of u/s sampler. Used 1' section from d/s sampler line. Δ'd to 3' tubing length (min. allowed). Calibrated fine - was not significantly off. Reset length to 50' (same as before).

SITE VISIT SHEET (SR 405 Vortechs™ Monitoring)

Date/Time 10/11/01 Field Staff JP Weather cool (10°c) + cloudy

Pre-Strom Visit - or - (Post-Storm Visit) (circle one)

INLET			OUTLET		
Check Current Readings / Download:			**Check Current Readings / Download:**		
ISCO	Time? reset (Y/N)?	N	ISCO	Time? reset (Y/N)?	N
	Time downloaded	08:30		Level (ft.)	0.339
				Velocity (f/s)	1.34
				Flow (cfs)	0
				Total Flow (cf)	9370
				Sig/Spec str.	0/0
				Time downloaded	08:30 — DST

Pre - Storm Visit

INLET		OUTLET	
Battery (V)		Battery (V)	
Clean bottle (Y/N)?		Clean bottle (Y/N)?	
Pump tubing ok (Y/N)? Replaced?		Pump tubing ok (Y/N)? Replaced?	
Sampler tubing ok (Y/N)?		Sampler tubing ok (Y/N)?	
Strainer ok?		Strainer ok?	
Ext. desiccant ok (Y/N)? Changed?		Ext. desiccant ok (Y/N)? Changed?	
Int. desiccant ok (Y/N)? Changed?		Int. desiccant ok (Y/N)? Changed?	
Measure Dn level? Ok?		Measure Dn level? Ok?	
Sample Volume (ml)		Enable level (ft)	
Inspect Rain Gage		Pacing (cf) / Sample Volume (ml)	
Sampler enabled		Sample Enabled?	

Post - Storm Visit

INLET		OUTLET	
Equipment Ran Completely?	N	Equipment Ran Completely?	Y
Sampler Enabled (date/time)?	13:55 10/9	Sampler Enabled (date/time)?	13:56 10/9
Composite Began (date/time)?	09:24 10/10	Composite Began (date/time)?	09:25 10/10
Number of subsamples taken?	18/20	Number of subsamples taken?	20/20
Any subsample collection errors?	Y	Any subsample collection errors?	N
Last Sample (date/time)?	00:42 10/11	Last Sample (date/time)?	00:43 10/11
Est. Sample Volume Collected (ml)	(4.5) ~~3.5L~~	Est. Sample Volume Collected (ml)	(42) ~~3.5L~~ (slightly mor
Sample ID?	VDR-101101-IN	Sample ID?	VDR-101101-OUT

Y/N	Value	Storm Validation Criteria
Y	>6 hrs. (if known)	Was there an antecedent dry period of at least six hours?
Y	0.40 in.	Was total rainfall greater than or equal to 0.25"?
Y	~18 hrs.	Was runoff duration greater than one hour?

Y/N	Value	Flow-weighted Composite Sample Validation Criteria
Y	85 % (approx.)	Was greater than 75% of the total volume of the storm sampled?
Y	18 # subsample	Were at least 10 sub-samples collected at the inlet?
Y	20 # subsample	Were at least 10 sub-samples collected at the outlet?

20300/23912

Was a field duplicate collected? If so, Sample ID. N/A Field blank collected? If so, Sample ID. N/A

NOTES (including any problems with equipment or maintenance activities performed):